CG

PATENT ABSTRACTS OF JAPAN

(11)Publication number : **09-034982**
(43)Date of publication of application : **07.02.1997**

(51)Int.Cl. G06K 7/10
G06K 7/00

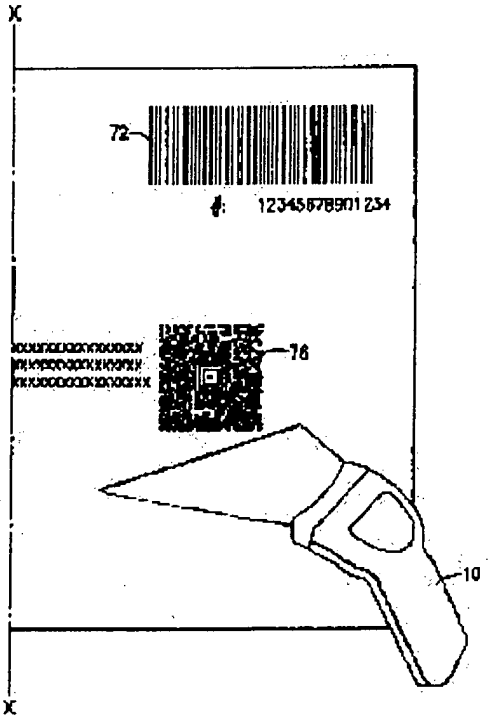
(21)Application number : **08-159625**
(22)Date of filing : **20.06.1996**

(71)Applicant : **WELCH ALLYN INC**
(72)Inventor : **LONGACRE ANDREW JR**

(30)Priority
Priority number : **95 504643** Priority date : **20.07.1995** Priority country : **US**

(54) METHOD FOR READING DECODABLE DISPLAY OF 1D OR 2D BAR CODE SYMBOL AND BAR CODE READER TO BE USED FOR THE SAME

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a method and device with which the decodable display of a one-dimensional(1D) or two-dimensional(2D) bar code symbol while using a bar code reader having only a 1D image sensor.
SOLUTION: When a reader 10 is asynchronously moved across the symbol of an object to be read, continuous 1D digital display is generated. This display is practically inspected in real time and when the symbol is a 1D symbol 72, it is immediately decoded. When the symbol is not the 1D symbol, it is inspected whether this display has one of variously different 2D finder patterns or not and when any finder is identified, concerning that finder, a 2D symbol 76 is decoded.



LEGAL STATUS

[Date of request for examination]	20.06.2003
[Date of sending the examiner's decision of rejection]	06.12.2005
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	
[Date of registration]	
[Number of appeal against examiner's decision of rejection]	

Best Available Copy

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] 1D slice ((1) of drawing 6 --) of 1D (72 or 78) or 2D (76) bar code symbol (72, 76, or 78) (2) or (3) are picturized and it is the digital display (a timer count) of this slice. Or it is the approach of reading and memorizing to asynchronous the display (83) which can decode said bar code symbol (72, 76, or 78) using the handheld computer bar code reader (10) which suits formation of a bit. The phase of providing for said reader (10) the memory tooth space (42A, 42B) which memorizes the digital display of two or more of said slices ((1), (2), (3), etc.), The phase which crosses said symbol (72, 76, or 78), is made to move said reader (10), and picturizes a series of 1D slices ((1), (2), (3), etc.) of this symbol, The phase which forms a series of digital display (a timer count or bit) which corresponds from said slices ((1), (2), (3), etc.) of a picturized single string, The phase of memorizing said digital display to said memory tooth space (42A, 42B) in the real time substantially, How to provide the phase which continues said storage phase until it reaches number with the sufficient number of the memorized displays (1 - N) to determine the data encoded by said symbol (72, 76, or 78) from the memorized display.
[Claim 2] the phase which forms said digital display -- said picturized slice ((1) --) The phase which forms (2) or (3) a timer count (42B) and a bit image (42A) display etc. is included. Said timer count display is used as digital display of the bar code symbol (72 or 78) decoded about a timer count (42B) display. Said bit image (42A) display is an approach according to claim 1 used as digital display of the bar code symbol (76) decoded about a bit image (42A) display.
[Claim 3] When continuation digital display (a timer count or bit) arises substantially, A (i)1D symbol (72 78) is received including further the phase (202) of inspecting the continuation digital display. An attempt and (ii) 2D symbol (76) are received in a decryption (206,208) of this symbol (72 78) about one or the timer count (42B) display beyond it. The location of the finder pattern (85) to a symbol (76) is checked. In order to identify, when it inspects continuously the bit image (42A) display of a symbol (76) (304) and the location of a finder pattern (85) is checked and identified The approach according to claim 2 of trying a decryption (318,320) of this symbol (76) about the bit image (42A) display memorized to said memory tooth space (42A, 42B).
[Claim 4] The method according to claim 3 of providing further the phase (214) which repeats a decryption phase (206) until it defines whether this symbol is a stack symbol (78) and a non-stack symbol (72) (212), sufficient train of a stack symbol (78) will be decoded if it is a stack symbol (78), and it forms a perfect message when said symbol is a 1D symbol (72 or 78).
[Claim 5] The phase (304) of inspecting the continuation bit image (42A) display to a finder pattern (85) (i) -- each mold (a waist band mold --) of a finder pattern (85) The phase of memorizing two or more suitable finder (85) discernment algorithms (AZTEC, Code One, etc.) for discernment of a peripheral mold etc. (304), (ii) The phase which carries out sequential execution of said finder discernment algorithm in order to define what kind of finder pattern is used into said symbol (304-320), (iii) The number (N) of the bit image displays memorized to said memory tooth space (42A, 42B) When sufficient number to decode the data memorized to said memory tooth space (42A, 42B) about the finder pattern (85) currently used by said symbol is reached, The method according to claim 3 of providing the phase (316) which stops additional storage (308) of a bit image (42A) display.
[Claim 6] One (AZTEC) of said the finder discernment algorithms is a method according to claim 5 of providing the phase which continues and compares the set of said number in order to discriminate the bit image display which has the bit of whenever [highest isolation] from the phase which derives a number of sets which show whenever [isolation / of each bit of said bit image (42A) display] from a continuation bit image (42A) display.
[Claim 7] Said finder discernment algorithm is an approach containing the 1st algorithm (AZTEC) which identifies a central mold finder pattern, the 2nd algorithm (Code One) which identifies a waist band mold finder pattern, and the 3rd algorithm (Data Matrix) which identifies a peripheral mold finder pattern according to claim 5.
[Claim 8] The approach according to claim 1 by which the storage phase of a continuation bit image display is carried

out FIFO, it is related with a single bit image display ((1), (2), or (3)) this, and the predetermined set of a continuation bit image (42A) display is substantially inspected and compared the real time to the symbol structure (85) which is not discriminable (304,306).
[Claim 9] The method according to claim 5 of providing the phase which reorganizes said bit image (42A) display, and makes the decryption easy after the phase (316) which stops additional storage of a bit image (42A) display.
[Claim 10] The method according to claim 5 of providing the phase of reorganizing said bit image (42A) display in order that the bit of a bit image display may form the bar code symbol image mostly put on the true relative position about said finder pattern behind the phase (316) which stops additional storage of a bit image (42A) display.
[Claim 11] 1D slice ((1) --) of 1D (72 or 78) or 2D (76) bar code symbol (72, 76, or 78) (2) or (3) are picturized and it is the digital display (a timer count) of this slice. And it is the approach of reading and memorizing to asynchronous the display which can decode said bar code symbol (72, 76, or 78) using the handheld computer bar code reader (10) which suits formation of/or a bit. The phase which crosses said symbol (72, 76, or 78), is made to move said reader (10), and picturizes a series of 1D slices ((1), (2), (3), etc.) of this symbol, The phase which forms a series of digital display (a timer count and/, or bit) which corresponds from said slices ((1), (2), (3), etc.), When said digital display (a timer count and/, or bit) arises substantially, in order to decide whether a symbol (72, 76, or 78) can decode as a 1D (72 78) symbol With the phase of inspecting the digital display, if decode is possible as a 1D symbol (72 or 78) If decode is impossible as a 1D symbol (72 78) in the phase which decodes said symbol as a 1D symbol about one or the digital display beyond it (timer count), (206) The location of 2D finder pattern (85) to said symbol (76) is checked. In order to identify, when it inspects the set of said digital display (bit) and the location of a finder pattern (85) is checked and identified (306) How to provide the phase (318) which decodes said symbol as a 2D symbol (76) about a filter pattern and said digital display.
[Claim 12] The method according to claim 11 of providing further the phase which repeats a decryption phase (206) until it defines whether this symbol is a stack symbol (78) and a non-stack symbol (72) (212), sufficient train of a stack symbol (78) will be decoded if it is a stack symbol (78), and it forms a perfect message when said symbol is a 1D symbol (72 or 78) (214).
[Claim 13] The phase (304) of inspecting the set of digital display (42A) to a finder (i) -- respectively -- each mold (a central mold --) of a finder pattern The phase of memorizing two or more suitable finder discernment algorithms (AZTEC, Code One, etc.) identifying a waist band mold etc. (304), (ii) in order to define what kind of finder pattern (85) is used into said symbol (76) The method according to claim 11 of providing the phase (304-320) which carries out sequential execution of said finder discernment algorithm, and the phase (308) which continues generating of a digital signal until it reaches number with the sufficient number (N) of digital display (iii) to decode a symbol (76).
[Claim 14] One (AZTEC) of said the finder discernment algorithms is a method according to claim 13 of providing the phase which continues and compares the set of said number in order to identify the phase which derives a number of sets which show whenever [isolation / of each bit of continuation digital display (42A) to said digital display (42A)], and the digital display (42A) which has the bit of whenever [highest isolation].
[Claim 15] Said timer count display (42B) is an approach according to claim 11 by which said digital display is used for decode of 1D symbol (72 or 78) including the timer count (42B) of said 1D slices ((1), (2), (3), etc.), and both displays of a bit image (42A), and said bit image display (42A) is used for discernment of 2D finder pattern (85).
[Claim 16] the slice ((1) --) of 1D (72 or 78) or 2D (76) bar code symbol (18) 1D image sensors which generate the output signal which changes in response to the image of (2) or (3) according to the content of data included in this slice (17), It has the processing circuit (20) which changes this output signal into the digital display corresponding to said slice. It is the handheld computer bar code reader (10) which reads and memorizes to asynchronous the display which can decode said bar code symbol (18). Said image sensors (17), When said reader (10) crosses said symbol (18) and moves in asynchronous, The programmed control means which answers said processing circuit (20) for generating the digital display (42A and/, or 42B) of the continuation slices ((1), (2), (3), etc.) of said symbol (18) (30), The memory tooth space (42) which memorizes substantially the digital display (42A and/, or 42B) of said continuation slices ((1), (2), (3), etc.) in the real time is provided. When said programmed control means (30) reaches number with the sufficient number of said displays (1 - N) to decide the data encoded in said symbol (18) about said memory tooth space (42) (208,214 or 308), The handheld computer bar code reader characterized by including the memorized program which stops storage of said digital display (42A and/, or 42B) (214 or 320).
[Claim 17] Said programmed control means (30) is a bar code reader possessing the central processing unit (40) which controls generating of said digital display according to claim 16 according to the DMA circuit device (35) which controls the storage to said memory tooth space (42) of said memorized program and said display.
[Claim 18] Said programmed control means (30) is a bar code reader according to claim 16 which generates a timer count display (42B) and fatbits (42A) of said continuation slices ((1), (2), (3), etc.), and makes said fatbits (42A) from

said timer count display (42B) (302) and which is programmed like.
[Claim 19] It is the memorized program which inspects said digital display in the real time substantially [in order to determine whether the picturized symbol (18) can decode said memorized program as a 1D symbol (72 or 78)]. If a symbol can be decoded as a 1D symbol (112), the symbol will be decoded, without investigating a finder pattern (200). If decode is impossible as a 1D symbol (112), in order to discriminate the finder pattern currently used there from two or more finder patterns (central mold and waist band mold etc.) The bar code reader according to claim 16 which is the memorized program which decodes a symbol about a finder pattern (318) when said digital display is inspected (304) and the mold of this finder is identified.
[Claim 20] If the picturized symbol is a 1D symbol, said memorized program this 1D symbol (72 or 78) -- a stack 1D symbol (78) -- or it determining, and whether it is linear 1D symbol (72), if it is a stack 1D symbol (78) The bar code reader according to claim 19 which decodes each train of this 1D stack symbol (78) until the data which constitute a perfect message are fully obtained and which is constructed like (206-214).
[Claim 21] The component program for two or more finder discernment by which said memorized program is adapted for each type (central mold and waist band mold etc.) of finder pattern recognition (AZTEC, Code One, etc.), This component program is applied to the sequential aforementioned digital display. A bar code reader including the program (304-320) which determines most the component programs (AZTEC, Code One, etc.) corresponding to the finder pattern currently used for said symbol according to claim 19.
[Claim 22] Said component program for finder discernment is a bar code reader including the 1st component program (AZTEC) which identifies a central mold finder pattern, the 2nd component program (Code One) which identifies a waist band mold finder pattern, and the 3rd component program (Data Matrix) which identifies a peripheral mold finder pattern according to claim 19.
[Claim 23] One of said the component programs for finder discernment is a bar code reader including the program which continues and compares the set of said number in order to determine whether to have the digital element with which a number of sets which show whenever [isolation / of a digital component] are drawn from continuation digital display, and any of said display have whenever [highest isolation] according to claim 21.
[Claim 24] Said continuation digital display is a bar code reader according to claim 19 which is inspected and compared in order to identify the symbol structure (85) which memorizes with FIFO and the subset of a continuation digital (bit) display cannot display by single digital (bit) display by this (304,306) and which was made like.
[Claim 25] Said program is a bar code reader according to claim 21 which stops storage of digital display after a sufficient number (N) of displays which are sufficient for decoding said symbol are generated and which was made like (316).

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the approach and equipment which read and memorize to asynchronous the display which can decode-dimensional [1] or a two-dimensional (2D) bar code symbol about a bar code reader using the handheld computer reader equipped only with 1-dimensional (1D) image sensors in more detail.
[0002]
[Description of the Prior Art] The 1-dimensional light bar code reader is known well technically. As an example of this kind of reader, it is Welch Allyn. There is a bar code reader currently manufactured by the shrine (Welch Allyn, Inc.) by the proprietary product name of "SCANTEAM 3000 series." These readers contain the UPC/EAN code currently used widely in the supermarket, and the microcomputer which can read the 1-dimensional (1D) linearity bar code symbol of Code39 grade. Such a 1D linearity symbol can read the symbol by one scan in alignment with the shaft, supposing it has characterized by having the information encoded by the width of face of Bar and a tooth space only in accordance with one shaft and scan data are measured in resolution high enough.
[0003] In order to enable it to encode the data of a large quantity to one bar code symbol, many 1D stack bar code notation notations including PDF417 of a publication were developed [with an United States patent number / No. (artificer: Allais) 4,794,239 / with a number / Code49 and the United States patent number No. (artificer-avlidis, et al.) 5,304,786 / of a publication]. for a stack symbol's reconfigurating the whole message from a break and this symbol in two or more trains whose each is one D bar code patterns in itself about coded data -- all these trains -- or all must almost be scanned, it must decode and, subsequently this must be connected. The scan in this case is attached only to one dimension, and requires still comparatively high resolution, and a multiplex scan is needed for reading the whole symbol.

[0004] The 3rd bar code notation NOT-AND operation notation called a free scanning direction and two-dimensional (2D) matrix notation NOT-AND operation notation which offers larger data density and capacity compared with 1D notation NOT-AND operation notation was developed. 2D matrix code encodes data as a light-and-darkness cel within the regular-polygon matrix accompanied by a graphic form finder (graphical finder), bearing, and criteria structure. Generally it is required that the image with which these matrices are recorded by 2D image with which the target field was memorized, i.e., the level resolution with the almost same vertical-related both, should be decrypted.
[0005] In the "exaggerated ZABERUTO" (over the belt) (for conveyors) reader of a publication, 2D image of a migration symbol is read [with an United States patent number / No. (artificer-ierce, et al.) 4,634,850] in a series of 1D slices by 1D image sensor using the exact information about a motion of a conveyor or an article. 2D image sensor by which a well-known handheld computer 2D image reader picturizes the whole symbol at once -- or although any of 1D image sensor which picturizes one slice of a symbol at once are needed, 1D image sensor needs the wheel for synchronizing with motion and/, or a belt. Since a symbol conveyance front face smooth [this type of 1D image reader] and flat is needed, an available solution is not offered in the large range to the problem referred to as read and recording 2D bar code symbol which can be decoded certainly and efficiently. On the other hand, 2D image reader is attached comparatively at an expensive price.
[0006] Therefore, the easy and cheap handheld computer bar code reader which can be used without being able to read both 1D and 2D bar code symbol, and requiring a synchronous element or a signal is needed.
[0007]
[Problem(s) to be Solved by the Invention] According to this invention, 1D image sensors are used and the improved bar code reader which can read both 1D and 2D bar code symbol is offered. This bar code reader operates a bar code symbol according to 1-dimensional-like and the new approach of picturizing to asynchronous, and it is improved so that the

digital display of one or more picturized slices of a bar code symbol may be read and memorized. As for these one or the digital display beyond it, in the case of 1D linearity symbol or 1D stack symbol, it is desirable to include the "timer count" display of the picturized slice, i.e., the display which recorded the count of generating of the transition (transition) produced during the slice. As for these slices, it is desirable to have the resolution which enables exact decode of the information which crossed all the code bars of symbol each train, and extended, and was encoded by the symbol.
[0008] In the case of 2D matrix symbol, these digital display constitutes the display which recorded each data element of the "bit image" of the picturized slice, or a "map bit" (bit mapped) display, i.e., the picturized slice, or the location of a bit. Moreover, when considering the bit image display (it is hereafter called "fatbits" for short in many cases) which plurality follows as a whole, they are methods with the bit near the method of the location in the physical space of the printed symbol which forms the symbol, and include the display (mapped) memorized or mapped by room. Since there is such close relation, if a finder pattern is identified once and the location is defined, the fatbits read and memorized can be used and decoded by the almost same method as 2D image read and memorized by 2D bar code reader.
[0009] The bar code reader by this invention can be used for it at both 1D and 2D bar code symbol, if the important thing is equipped with the software which can distinguish the various bar code notation NOT-AND operation notation with which it is used. When distinguishing 1D and 2D symbol, a reader will decode a symbol using one or the timer count display beyond it including the software which distinguishes 1D bar code symbol and 2D bar code symbol, if a symbol is a 1D symbol. When distinguishing various 2D symbols, a reader will decode a symbol using the memorized fatbits, if a finder pattern is recognized including the software which can explore continuously the existence or nonexistence of the finder pattern by which 2D bar code notation notation with which versatility differs is characterized. these two results have the substantial bar code reader of this invention in both timer count and fatbits about an object symbol -- it is attained easily [generating in the real time] simultaneous.
[0010]
[Means for Solving the Problem] As stated in more detail below, one of the important advantages of this invention is a point equipped with the capacity to decide when data reading is stopped from 2D symbol only based on the information included in the picturized continuous slice or continuous scan. This invention has realized this capacity by investigating substantially the fatbits of the slice picturized continuously in the real time in order to know the existence or nonexistence of the various finders used with 2D bar code notation notation. In these finders, it is Data. The "peripheral" (peripheral) mold finder used with the Matrix notation notation, Code There is the "central" (central) mold or "bull ZUAI" (bull's-eye) mold finder currently used with the "waist band" (waistband) mold finder used with the One notation notation, Maxicode, and an Aztec notation notation. The notation notation described at the end is indicated by the United States patent application number 08/No. 441,446 of the May 15, 1995 application which entitles "Two Dimensional Data Encoding Structure and Symbology For Use With OpticalReaders."
[0011] According to the bull ZUAI mold notation notation, existence of central FAINDA is recognized with the advent of the figure pattern which is led from the above-mentioned fatbits which carries out continuation and which is easy to recognize using the new finder discernment algorithm described below. According to a "peripheral" mold and the "waist band" mold finder, a finder is Data. Matrix and Code It is discriminable with the well-known finder discernment algorithm about an One notation notation. When carrying out automatic discernment of the symbol with one or more finder molds, these finder discernment algorithms can be applied as a candidate algorithm succeeding alternation until discernment is actually successful and decode becomes possible.
[0012] In the suitable example of the approach by this invention, the advantage has been acquired from the following data. That is, in order to change the video signal over 1D slice of a symbol into a "timer count" display, they are the data of saying the programmed control circuit device in which it operates with the timing signal of constant frequency that many 1D bar code readers have already contained. These timer count display of a symbol is substantially generated in the real time to each of the continuation slice of a symbol, when moving a reader manually so that a symbol may be crossed. In this way, these generated timer count display is memorized in the location which followed timer count room. These timer count display uses an easy well-known conversion algorithm, is changed into corresponding fatbits, and, almost simultaneously with this, subsequently to image memory space, is memorized. Thus, the approach by this invention is carrying out the maximum utilization of the possible advantage of the capacity of the existing 1D bar code reader so that both 1D and 2D symbol can be distinguished and decoded by the existing 1D bar code reader. However, as long as it is not so important to use the advantage of the existing bar code reader capacity, a reader may be designed so that a timer count and a bit image signal may occur that it is simultaneous and independently.
[0013] When it turns out that a reader is used for reading of only 2D bar code symbol, it is not necessary to include the processing phase (or circuit device) of performing discernment and processing of 1D bar code symbol in the approach (or equipment) of this invention. Therefore, in the example in the case of the latter, generating of a timer count display

poses a selection problem of whether to include it according to whether it is useful for generating of the fatbits used for 2D bar code symbol. In the example in the case of the latter, the processing phase or program part used only for discernment and processing of 1D bar code symbol may be omitted.

[0014] according to the 2nd description of this invention, digital display will be substantially memorized by both above-mentioned memory in the real time with FIFO (first in-first out basis) with the display of the old slice shifted through memory (or -- at least -- an address pointer -- related), if the display of a new slice is memorized. If the terminal point of room is arrived at, the old slice display will be reinputted at the starting point of room. Consequently, two rooms will contain two read symbols list ** which one says as a timer count display and another says as fatbits and through which it circulates. The newly received set of a timer count display will be promptly decoded, if it is investigated when it arises, and they show existence of 1D symbol. If this decryption is not successful and the possibility of the existence of 2D symbol is shown, fatbits will be investigated in order to decide whether discernment and positioning of a finder are possible. When a finder is identified and positioned, the part of the symbol picturized next is known. The processing which finds this finder continues the image pick-up of a symbol until sufficient symbols list ** required to decode a symbol is memorized.

[0015] Then, fatbits is selectively reorganized so that both each data bit and a finder pattern may be located in a true relative position mutual [these] (for example, the re-writing or the re-address in different sequence). Although this is carried out within image memory, as long as that image memory space is too small, this reorganization may be performed in the process in which fatbits is moved from image memory to timer count memory. In any case, the bit image obtained as a result is in the condition that it can decode using the decode algorithm relevant to the notation notation shown with the mold of the found-out finder.

[0016] He is trying for this invention to have the point [similar] of a certain 1D bar code reader and many from the former except for the following points in the field of equipment. That is, about how to take the timing of equipment, memory structure, and the programming method, it has changed so that equipment can be used according to the approach which described the outline above. Furthermore, if it says in detail, the equipment of this invention contains 1D bar code reader from which only sufficient amount to picturize many continuation slices of a symbol increased the rate of a clock signal, when crossing a symbol and moving it. Furthermore, with the memory structure of a reader, the above-mentioned room is corrected so that the timer count relevant to these slices and the storage operation of fatbits, and shift actuation may be enabled. After memorizing a sufficient number to identify and decode the notation NOT-AND operation notation about the programming method finally based on the mold of the finder currently used there if it corrects so that generating and storage of fatbits may be harmonized in order to distinguish 1D and 2D bar code notation NOT-AND operation notation, and 2D notation NOT-AND operation notation is used of digital display, he is trying to stop the image pick-up of a symbol. (Since error correction data are encoded by 2D bar code symbol with the message data, a point for it to be careful about the point described at the end here will be a point that a message can sometimes often be decoded thoroughly, even if a part of symbol is lost) . Since the function which these corrections bring about is already described in the outline of the point about the approach of this invention, repetitive explanation here is omitted.

[0017] About other objects and advantages of this invention, it will become clear from the following publications and a drawing.

[0018]

[Embodiment of the Invention] Drawing 1 shows the block diagram of the bar code reader of the type suitable for operation of this invention. This bar code reader will be Welch Allyn if correction of a certain extent mentioned later is performed. You may be the model ST-3000-22 mold 1D bar code reader put on the market at the shrine (Welch Allyn, Inc., Skaneateles, New York).

[0019] This bar code reader contains the lighting system possessing two or more 660nm light emitting diodes 16 which illuminate the narrow strip or narrow slice of width of face of a bar code symbol 18. Since the optical focusing arrangement 19 of a publication is provided [with an United States patent number / No. 5,291,008 / transferred to the applicant for this patent], the reader 10 is described for reference. the optical focusing arrangement 19 -- the light-receiving way 14 -- meeting -- the reflected light from a bar code symbol -- the charge coupling mold 1D image sensor 17 top -- condensing -- or image formation is carried out. A sensor 17 generates the analog signal which shows optically the content of the perfect slice of the bar code symbol which can be read. This analog signal is supplied to a digital disposal circuit 20, and this digital disposal circuit performs signal conditioning and digitization processing using the clock signal received from a RF timing signal or the clock input line 23. Since this digitization processing is performed [with an United States patent number / No. 5,294,783 / of an applicant for this patent] using the analog reconstruction circuit of a publication, it states for reference. The video signal display obtained as a result of the image pick-up of a slice is supplied to the control circuit device 30 in which drawing 1 was programmed through the output line 25.

[0020] The programmed control circuit device 30 plays various roles required for actuation of a reader, possesses the MC68HC11 microcontroller / microprocessor of Motorola, Inc. (Motorola), and contains the central-process unit 40 which has 64 K bytes of address space. This microprocessor contains a serial and parallel I/O, interrupt logic, an oscillator, and clock logic. As for the microprocessor 40, access is possible to 8 K bytes of static random access memory (SRAM) 42, and 32 K bytes of read-only program memory (PEROM) 45. The capacity of a microprocessor 40 is Welch Allyn. It is raised by the multifunctional application specification integrated circuit (ASIC) 35 put on the market by the goods number 21203276-01 from the shrine. As shown in drawing 1 , ASIC35 has the four main functional subunits or a block. Although the clock control subunit 43 makes easy a change-over of rate of scan 50,100,200 scan / second of image sensors 17, in this invention, only the rate of a scan of the latter, i.e., 200 scans / second, is used. The memory management subunit 46 (MMU) offers memory management capacity. The timer / DMA subunit 48 linked to a digital disposal circuit 20 automate image reading for the next processing. Finally, the interface subunit 44 works through a line 37 as a RS-232 communication link interface for a bar code reader 10. ASIC35 and its subunit enable it to concentrate the means on a decryption of the data which the microprocessor 40 read from the bar code symbol. ASIC35 is controlled by the microprocessor 40 through the suitable bus 39 as a whole.

[0021] The timing of the circuit of drawing 1 is controlled by ASIC35 based on the timing signal received from Xtal 49. Frequency of 7.3728MHz contained in 3000 to model ST22 bar code reader before repair in order to deal with the high rate of an image sampling required to raise the engine performance of a reader and read a two-dimensional bar code symbol About Xtal, it is the frequency of 14.7456MHz. It transposed to Xtal. The following were used for repair of others to the basic model ST 3000-22.

[0022] SRAM42: 70ns of lot number CXK5864BM-70L put on the market from Sony Corp. (Sony Corp.), 8Kx8 CMOS RAM.

[0023] PEROM45: 90ns of lot number AT29C 256-9 put on the market by ATMEL ROM.

About above-mentioned repair, the activity of a RF timing signal is the most important for this invention, and other repair is for ensuring dependability of the circuit actuation in this RF.

[0024] The firmware (firmware) in PEROM45 includes the program memorized for the microprocessor 40. The part of the program constituted in PEROM45 is the usual thing, and is a part as which a bar code reader 10 is operated as a usual automatic discernment reader to a linearity bar code symbol. Speaking generally, firmware's 60 containing the four main program segments, as shown in drawing 2 . The multisystem function manager directed by the reference number 62 includes functions, such as an I/O monitor between control of initialization of volatile hardware and a memory area, a scan, and decryption actuation, sequence-izing and a bar code reader, an operator, and an external device, and maintenance.

[0025] The decryption function (decoding function) directed with the reference number 64 is attained through some phases. The preliminary test about the existence or nonexistence of 1D bar code symbol is performed to the beginning. If there is a 1D linearity symbol, a decryption of a symbol will be tried until a decryption of a symbol is successful about the timer count display of a slice. For this object, it comes out enough by 1 timer count display of a symbol, and there are many a certain things. When it is shown that there is a 1D stack symbol to which the stack of the display was carried out further, this procedure is repeated until all the trains of a symbol are decoded. If it becomes clear that a symbol is a 2D symbol, the symbol will be substantially investigated about the continuation fatbits of the picturized slice which is memorized by SRAM42 on real time. In the meantime, a display is investigated in order to identify the mold and location of a finder pattern to this display. This discernment is easily performed by the following data. That is, it is because much fatbits can be used simultaneously, so the recognition from only one fatbits and recognition of DS like the finder whose discernment is impossible are attained. If a finder is decided, additional fatbits will be memorized until it memorizes the fatbits of sufficient many to decrypt a symbol. Subsequently, memorized 2D image is decoded using the decryption algorithm of the type suitable for the symbol used for encoding a symbol.

[0026] An image top is run for a scanner 1 time or more than it until it usually carries out the trigger (or automatic scanning mode set) of the user in actuation of a reader, an alarm tone (for example, beep sound) can be heard and decode information is outputted (a sweep is carried out). Moreover, in this case, a user may specify manually whether 1D and 2D code should be read, and may place it, and can also decide automatically by the reader.

[0027] The menu facility which a reference number 66 shows is a routine specially answered and called to a decryption of a bar code symbol, and is the so-called bar code "a menu" which sets the non-volatile bit or value in the configuration field where PEROM45 was specified, and manages-izing of many operating characteristics of a scan of a bar code reader 10, for example, a rate, the amount of alarm tones, a mode of operation (hand control or automatic trigger), and specific bar code notation NOT-AND operation notation which can be decoded.

[0028] Communication facility 68 is a function to operate hardware, and contains the protocol required to distribute scan

data to attachment. A bar code reader 10 can support many communications protocols and interfaces including a terminal, a keyboard wedge, etc. of a laser output, OCIA, OCR, RS-232, and various marketing.

[0029] If the circuit device of a reader and the point about the above-mentioned correction to programming are removed, a reader 10 will be a reader of the type which can get by this contractor in a commercial scene, and is understood. Therefore, it omits explaining further here about drawing 1 and the circuit device of the graphic display to 2. Drawing 3 is the enlarged drawing of SRAM42 showing how SRAM42 is organized as an object for operation of this invention. In the example of the graphic display to drawing 3 , 8 K bytes of room included in SRAM42 is divided into three groups. That is, it has about 3.7 K bytes of the 1st room, i.e., image memory space 42A, 4 K bytes of the 2nd room, i.e., timer count room 42B, and the 3rd room, i.e., the capacity of 0.3 K bytes, and it is divided into the group of accessory room 42C used as a set of the general-purpose register for the preparation facilities (housekeeping functions) of the usual microprocessor while being used as a "connectivity (connectivity)" register in the phase of identifying the finder pattern of a symbol. Please understand not interfering, even if the number of these groups is only an example of a type, these rooms may be on the same chip and it is on a separate chip.

[0030] In the suitable example of this invention, this 2nd room 42B is used for receiving and memorizing the continuation timer count display about each slice of the bar code symbol picturized when crossing a bar code symbol and moving a reader 10 manually by the FIFO (first in-first out) method. In the case of 2D symbol, migration of this reader may be asynchronous and may be good, and if the migration direction is picturized possible [decode of a symbol] enough along that direction, it may be what kind of direction. However, in the case of 1D symbol, migration of a reader may be asynchronous similarly, but each code bar of a symbol must be performed within the limits of the direction included in a timer count display. From 1, zero, the video signal from a digital disposal circuit 20 of the number contained in each timer count display is the number of the timing pulses generated every, whenever it passes or changes to 0-1. The data from the video signal of the picturized slice are changed into the timer count display which corresponds how, and it is shown in drawing 8 and drawing 9 whether subsequently to timer count memory 42B it memorizes.

[0031] Similarly, the 1st room, i.e., image memory space 42A, is used for receiving and memorizing with FIFO the continuation fatbits about each slice of the bar code symbol picturized when crossing a bar code symbol and moving a reader 10 manually. Although such fatbitses differ in the timer count display and format, they include the same information substantially. Conversion to other formats from one format can be performed using a known conversion algorithm. In the suitable example of this invention, the fatbits of each slice is drawn from the timer count display corresponding to it using an algorithm as shown in drawing 8 and drawing 9 . This conversion can be carried out because the timer count generating circuit device of 1D reader of existing which performed the minimum correction, and programming can be used. However, still more generally the fatbits of the slice by which the bar code symbol was each picturized can also be drawn from a direct video signal. While a reader crosses a bar code symbol and moves, a series of examples which show how fatbits of each continuation slice "is shifted" through image memory 42A are shown in drawing 7 (A), (B), and (C).

[0032] Drawing 4 and drawing 5 are drawings having shown the bar code reader by this invention, and the package which marked several examples of the bar code symbol of the type which this reader can read together. 1D linearity bar code symbol 72, 1D stack symbol 78, and the 2D bar code symbol 76 are contained in these examples. If there is no limit about resolution, memory, or signal processing in a bar code scanner, all the symbols of a graphic display here can be read with a scanner in all the directions, i.e., what kind of direction, in principle. Since comparatively low resolution is required along with biaxial [biaxial and the reader which designed this omnidirectional reading as such symbols in the case of 2D bar code symbol cross at right angles mutually], it can attain easily. In the case of 1D bar code symbol, since information is encoded by the location of the edge of the code bar of a symbol, the high resolution only in alignment with the horizontal axis of a symbol becomes important. With the need for picturizing all the code bars in the slice each picturized, this will place a practical limit about the range of the direction which can read 1D symbol. So, although both this inventions can read 1D and 2D symbol, it serves as perfect omnidirection nature from the reasons of actual only to 2D symbol.

[0033] Drawing 6 , drawing 7 , drawing 8 , and drawing 9 show how 2D bar code symbol using above-mentioned Aztec notation NOT-AND operation notation is read by the approach and equipment by this invention. The line segment (1) of drawing 6 , (2), and (3) express various 1D slices picturized by the reader, when the 2D bar code symbol 80 is crossed and a reader is run (the sweep was carried out). As shown in drawing 8 and drawing 9 , the each picturized slice forms a video signal 82. Sequential storage is carried out in each location in memory 42B which the timer count showing the count of transition generating between the image elements said from black to white and from white to black is measured continuously, and works as timer count memory. If the timer count display of each slice is recorded on timer count memory 42B, the timer count data of a precedence slice will be changed into the fatbits of the slice, and will be recorded

on each location in memory 42A which works as image memory.
[0034] In the suitable example of this invention based on corrected 1D reader, conversion to the fatbits which corresponds from a timer count display mentioned above is carried out by the microprocessor 40, and storage of a timer count display and fatbits is processed by the timer and DMA subunit of ASIC35. Since there are only all 8-K byte rooms of SRAM42, the amount of rooms which can be used for storage of a bit image is restricted to about 3.7 K bytes. Consequently, the bit image built by the example of drawing 1 becomes comparatively low resolution, i.e., the resolution of 170 lines to which each changes from 176 bits. However, it can be increased by this resolution if needed by increasing the storage capacity of SRAM42, or increasing the number of the optical response elements of/or the 1D sensor 17, or raising the frequency which investigates a video signal about/or transition generating.
[0035] The fatbitses 81, 82, and 83 of drawing 7 (A), (B), and (C) express the content of image memory 42A after a reader picturizes the symbol slice (1) of a symbol 80, (2), and (3), respectively. After the location of a "stop" is being fixed about the location of "FAUNDO" and the pattern appropriate for a finder is checked by drawing 7 (B) and (C) here, the scan of the specific number N is made. As for drawing 7 (B), the scan of N book shows that the address pointer P has not arrived at a "stop" location yet by unfinished, and drawing 7 (C) shows that the scan of N book was completed and the address pointer P arrived at the "stop" location. If image memory 42A fills to the termination as shown in drawing, since the input pointer P returns at the starting point of room, each slice of a bit image will mind image memory, and will shift or circulate through it effectively. The same circulation as this takes place also about the timer count display memorized by timer count memory 42B. The situation of these display circulation is shown as a closed loop drawn on drawing 9 with the broken line.
[0036] If the fatbits of a symbol 80 is picturized and memorized, analysis (it mentions later) for investigating whether fatbits has a finder pattern will be performed. If 2D symbol is using the Aztec notation notation, this finder pattern will include the shape of drawing 6 , drawing 7 , and a nest which gave the reference number 85 to drawing 8 , and was drawn by black and white, i.e., a concentric square set. Drawing 7 R> 7 (B) and (C) show the symbol images 82 and 83 containing this finder pattern. If this finder pattern is found, in order to memorize resolving of sufficient symbol to decode a symbol certainly, data are processed from the predetermined number of the additional slice of a symbol, and it is inputted into timer count memory 42B and image memory 42A. Since the location of the image which could be related with the boundary (namely, the address pointer P) of room cannot be predicted in advance, an image may be memorized by two parts as shown in the bit image 83 of drawing 7 (C). If desirable, in order to relieve decode processing, by reorganizing the fatbits memorized by image memory (formation of re-sequence), these two parts are mixed and it is good also as a single image. The object of this reorganization is that the image of the bar code symbol in which perfect decode is possible, i.e., the bit of bit image display, forms certainly substantially the image located in those true relative positions in room about a finder as a whole. Therefore, the bit which adjoins mutually in the physical space containing a printing symbol will adjoin mutually also in the room containing a corresponding storage image.
[0037] When image memory space 42A is too small for above-mentioned reorganization-izing, the same result can be obtained also by shifting an image to timer count memory as a perfect unit which has all the parts of the image containing the finder in the same side as the pointer of timer count memory. Although such image shift will overwrite the data written in timer count memory from before, since the data currently written in timer count memory are not required any longer, this address processing does not pose a problem.
[0038] Although the above-mentioned reorganization about the image of the read bar code symbol is desirable, please understand that it is not what constitutes the essential part of this invention. Although this kind of reorganization is desirable in being required for a decryption algorithm of a certain kind, it is because it is not important except [its]. It is dependent on the class of finder pattern currently used for the bar code symbol whether such reorganization is required, or advantageous, is clear, and there is. [any] So, the reorganization of this invention is required for a decryption, or it supposes that reorganization of the bar code symbol image read when advantageous takes it into consideration, and reorganization in case the need or usefulness does not exist is not taken into consideration.
[0039] A series of trial which decodes the strange symbol as 1D linearity symbol or a 1D stack symbol, and when that trial is impossible, an above-mentioned image reading process identifies 2D finder, and is performed within the framework of an image-analysis process including a series of trial which decodes a symbol using this identified finder, or a type classification process, so that it may state in more detail here. It is made for by referring to the flow chart shown in drawing 10 and drawing 11 to have shown the all-inclusive image-analysis process best. It is made for by referring to the flow chart of a graphic display to drawing 12 and drawing 1313 to have shown the analysis part about 1D symbol best. Moreover, it is made for by referring to the flow chart of a graphic display to drawing 14 and drawing 15 to have shown the analysis part about 2D symbol best. In order to give precision and "relevance (connectedness)" to drawing, drawing 12 , 13 and drawing 14 , and two flow charts of the graphic display to 15 contain a part of drawing 10 and flow chart

(drawing 12 , 13 and drawing 14 , on the broken line of 15) of 11 as induction to these flow charts.
[0040] Hereafter, the image-analysis framework summarized above is explained with reference to drawing 10 - drawing 15 . If it stands on drawing 10 and the flow chart of 11 first and returns and explains, image analysis will begin from the block 102 which asks a reader for trigger press standby. If a trigger is pushed, a reader will start the scan for which block 104 asks, and imaging of the storage slice by the timing device (if a trigger press is generated). Subsequently, a reader investigates whether the trigger is still pushed (block 106). the scan if the trigger is not pushed, before reading finishing a reader and returning to a standby condition (block 102), and immobilization (disabling) (block 120) of a timing device -- Mukai -- **** -- it gets to know that it is. If the trigger is still pushed, it will wait for a reader till completion of the next scan slice (block 108), subsequently it will progress to block 200, and will start suitable image analysis.
[0041] If the block 200 described in more detail about drawing 13 exists, a processing phase required to decode 1D symbol of which type is expressed, and if a reader reaches this block, it will try activation of this decode process. It continues this trial until this trial is successful and a perfect message is prepared, or until this trial fails in a reader. If a reader prepared namely, (block 112) judges a perfect message to be "data-preparation completion" (data ready), before immobilizing a scan and a timing device (block 120) and returning to a standby condition (block 102), a reader generates the beep sound demanded with block 118, and outputs the data.
[0042] As for block 112, a reader is turned to block 300, when a reader cannot decode a symbol or is not able to make a perfect message. This block 300 expresses the processing phase required to also decode what type of the inside which exists variously of 2D symbol. one reason which cannot carry out the data preparation (block 112) of the reason for performing this processing phase -- a symbol -- 1D symbol -- not but -- that is, it is because it may be 2D symbol. However, whether this is actually so then still remains as an object for decision. It says because there tended to be breakage or possibly it was going to read 1D symbol in the direction which a symbol is not allowed to the reason "whose data preparation" were not completed. Therefore, block 300 gives a chance to decode an object symbol as a 2D symbol to a reader, before a reader gives up reading and returns to a standby condition.
[0043] If the processing phase demanded by block 300 is completed, if a reader judges whether the message which can be decoded was prepared (block 116) and prepared, it will output the data and will return to a standby condition. If the message which can be decoded cannot be prepared, before a decryption becomes possible, still much more imaging of 2D symbol may be the thing which is the need. Consequently, if a reader repeats an above-mentioned analysis process about an additional scan slice and it is made, it will output a message and will return to a standby condition, until it is returned to block 106 and can prepare the message in which perfect decode is possible.
[0044] The above thing shows only then outputting eventually the message which can be decoded from 1D and 2D symbol, if read from the direction which reading of a symbol was possible for the analysis processing shown in drawing 10 and the flow chart of 11, and was allowed. Under these circumstances, a reader determines eventually which symbol type and subtype there were as a matter of fact by deciding whether it became the message which can decode which symbol type and subtype.
[0045] Drawing 12 and 13 show the process (under a broken line) required to decode the data encoded there and collect into a message, when there is any of 1D linearity symbol or 1D stack symbol they are. These processes use drawing 10 and the process of the elimination same with having described above in relation to 11. Furthermore, if it says in detail, it will be determined whether this flow chart has 1D linearity symbol or 1D stack symbol by trying a decryption of one symbol first and determining whether one or other symbols exist by whether subsequently the decryption which tried the decryption of other symbols and tried was successful.
[0046] Since 1D automatic distinction Argo RUZUMU (namely, algorithm which discriminates from any subtypes from which 1D linearity symbol differs variously, and can be decrypted) is known well technically, it omits what is described in detail here about the processing phase included in performance of the treatment demanded by the blocks 202-210 of drawing 13 . Similarly, since the suitable algorithm for a decryption of 1D stack symbol is indicated by the Allais patent referred to before, it omits what is described in detail here about the processing phase included in performance of the treatment demanded by the blocks 212-214 of drawing 13 .
[0047] The finder pattern of the different type and the data encoded by 2D symbol which has finder patterns, such as a central finder (central finder) and waist band finder (waistband finder) and a peripheral finder (peripheral finder), especially (if it was) are decoded to drawing 14 and 15, and the processing phase included in the processing summarized in a message is shown in them (under a broken line). activation of this processing -- setting -- drawing 14 R> -- 4 and 15 have adopted the same elimination processing with having described drawing 10 and 11. Furthermore, if it says in detail, after changing a current timer count display into corresponding fatbits (block 302), it judges whether according to a demand of blocks 304 and 306, a reader relates current fatbits with the fatbits of some precedence scan slices, and has a pattern like a finder. This judgment can be performed by applying the fuzzy (fuzzy) logic pattern recognition technique

known well, the algorithm with which the publication is carried out to the United States patent number 5,401,949th (artificer: Ziemacki), some the candidate of a finder discernment algorithm, for example, an image-processing algorithm. If the pattern appropriate for a finder is found, a reader will read the display of sufficient addition to decode a symbol. It is carried out using this reading even in a scan counter and the related control block 308-316. After this is completed, according to a demand of block 318, a reader determines bearing of 2D image and tries the decode. If this decryption trial is successful, a reader will output that data and will return to a standby condition (block 320). If it finishes unsuccessful, a reader will return to block 106, in order to try a decryption once again.

[0048] Inspection of the fatbits set about the type of the finder (supposing it is) which is there includes the application of elimination processing using the same algorithm used by the conventional reader to the located finder. For example, Code The finder of the waist band mold which used the One symbol is AIM. USA Technology It can find out using the algorithm stated to "(issuance number TSC 059) Uniform Symbology Specification CodeOne" of Group issuance. Similarly, it is Data. It can find out using the algorithm recommended by the creator, and the peripheral mold finder using a Matrix symbol is Maxi. The circular (circular) central mold finder which used the Code symbol can be found out using the algorithm recommended by the creator. In the case of the Aztec symbol, the algorithm especially advantageous to finding out a finder is developed. This algorithm is Maxi. It is fully effective also about the symbol using the central mold finder another type like Code. Since it generally is not accomplished now yet, the explanation about the latter algorithm is described about this here.

[0049] Inside, in order to find out small "island" (black field) within inside [of large "rake" (lake) (white field)], and "island" (island) a "rake" etc., each bit of a continuation slice is inspected using a central mold finder pattern. It is carried out by defining how each pixel has separated this inspection from the top chord of an image, and the side side, and the core of bull ZUAI (bull's-eye) clarifies by this approach. The rapid scan algorithm for finding out such bull ZUAI structure is explained below.

[0050] It is C so that intelligibly for a computer programmer. The following algorithms described by Code define the core of the high "isolation" (isolation) point in the image memorized, for example, bull ZUAI. First, the full contrast image (fully contrasted image) of the "n" pixel ("n"pixels wide) of 2D bar code is memorized by the I [x] and [y] array (0 <=x<n), and each element I [x] and [y] assume that it is what takes the value of 0 (pair white) or 1 (pair black). The single image frame (0 <=y<m) from 2D sensor is sufficient as this image, and the image (0<=y<??.) which carried out rolling-off and obtained continuously 1D sensor which moves about a target may be used for it.

[0051] First, the value of "level" (level) array L[x]"n" is set up. L is an integer without a sign here. L is initialized by the value of the best train of I. Namely, [0052]

[Equation 1]

```
for (x = 0; x < n; x++) L[x] = I[x][0];
```

[0053] The train of the following image is processed to L by the biplane scan one by one. Namely, [0054]

[Equation 2]

```
for (y = 1; y < m; y++)
{
```

[0055] first, L [x] which sets L of a high-order end equally to the value I of the high-order end in the train, and subsequently continues when scanning on the right from the left -- (a) -- the current value (from the upper train), or the value of the left-hand -- small -- setting -- subsequently -- (b) -- 1 will be added if it is necessary to make new L and its corresponding I into even number or odd number. It is C about this. If it expresses mathematically using Code, it will become as follows.

[0056]

[Equation 3]

```
L[0] = I[0][y];
for (x = 1; x < n-1; x++)
{   if (L[x-1] < L[x]) L[x] = L[x-1];
    if ((L[x] ^ I[x][y]) %2 == 1) L[x] = L[x] + 1;
}
```

[0057] Next, when returning from the right to the left, right end L is set equally to the right end value I, and subsequently subsequent L will decrease only 2 (or the multiple), if only 2 (or the multiple) has crossed the right-hand. Namely, [0058]

[Equation 4]

```
L[n-1] = I[n-1][y];
for (x = n-2; x >= 0; x--)
{     while (L[x] >= L[x+1] + 2)  L[x] = L[x] - 2;
}
```

[0059] When processing of the data obtained from each scan performed from a train to a train one by one is repeated, the value of L begins to mean how the image field is isolated from the top chord and the side side. After processing the train which passes along the part of bull ZUAI, the value of a series of L in the near is as follows. : ... It is 2223333444555566655 544443333222.
The decision criterion of "the finder (namely, bull ZUAI) placed" is characterized as a continuous increment beyond four, four accompanied by the continuous reduction beyond it, or it in an isolation value. Maximum expresses the core of bull ZUAI. The scan (shown by the scan to the left from the above-mentioned right, however here as separated actuation) to L by the single state machine detects this condition.
[0060]
[Equation 5]

```
state = peakx = 0;
for (x = n-1; x ≥ 0; x--)
{       switch(state) {
        case 0:
        case 1:
        case 2:
        case 3:       if (L[x] < L[x+1])  state = 0;
                if (L[x] > L[x+1])  { peakx = x; state++; }  break;
        case 4:       if (L[x] > L[x+1])  peakx = x;
                if (L[x] < L[x+1])  state++;  break;
        case 5:
        case 6:
        case 7:       if (L[x] > L[x+1])  state = 0;

                if (L[x] < L[x+1])  state++;  break;
         default:
        }
 }
```

[0061] If this scan to L finishes it as "state" =8, point l [peakx] and [y] will become a candidate based on bull ZUAI. The examination which looks for possibility of the candidate who so has level higher than L that a true bull ZUAI core has isolation (isolation) of a record level is continued. If Variable peakl is initialized by zero at the beginning of a scan, the center position of the candidate bull ZUAI will be recorded as follows.
[0062]
[Equation 6]

```
      if ((state == 8) && (L[peakx] > peakl))
      {       peakl = L[peakx]; eyex = peakx; eyey = y;
      }
}
```

[0063] When the scan of a whole image is completed, "peakl" which is not the zero which show bull ZUAI (bull's eye) adjoins pixel l [eyex] and [eyey], and is found out. Moreover, after passing over the newest "peakl", in the case of the image which flows continuously, a suitable number of trains (for example, one half of an image buffer size) are read, and a scan is ended to it. This is the number "N" described about the above-mentioned block 308. This invention uses the method of reading the 2nd chosen so that reading may be ended by the scan of N individual, after passing over the

newest "peakl." Analysis is continued so that higher peakl, i.e., the candidate more in character with based on bull ZUAI, may be found. When all the picturized slices are memorized and a finder is defined, a symbol will be in the condition that it can decrypt about a finder.

[0064] This contractor is good and it will just be going to understand that it is possible to add modification variously at a fine point, without deviating from the pneuma and the range of this invention stated to the claim although this invention has so far been described about some examples of a graphic display. In addition, it is as follows if the response relation between the one section of this application claim and the publication of a description is shown. One (AZTEC) of said the finder discernment algorithms The phase which derives a number of sets (for example, paragraph number 59) which show whenever [isolation / of each bit of said bit image (42A) display] (paragraph number 59) from a continuation bit image (42A) display (paragraph numbers 51-59), The method according to claim 5 of providing the phase which continues and compares the set of said number in order to identify the bit image display which has the bit of whenever [highest isolation] (paragraph number 59).

[0065] Said finder discernment algorithm is an approach containing the 1st algorithm (AZTEC) which identifies a central mold finder pattern (paragraph number 49), the 2nd algorithm (CodeOne) which identifies a waist band mold finder pattern (paragraph number 48), and the 3rd algorithm (Data Matrix) which identifies a peripheral mold finder pattern (paragraph number 48) according to claim 5.

[0066] The approach according to claim 1 by which the storage phase of a continuation bit image display is carried out FIFO (paragraph number 31), it is related with a single bit image display ((1), (2), or (3)) this, and the predetermined set of a continuation bit image (42A) display is substantially inspected and compared the real time to the symbol structure (85) which is not discriminable (304,306).

[0067] The method according to claim 5 of providing the phase which reorganizes said bit image (42A) display (paragraph number 38), and makes the decryption easy after the phase (316) which stops additional storage of a bit image (42A) display. The method according to claim 5 of providing the phase of reorganizing said bit image (42A) display in order that the bit of a bit image display may form the bar code symbol image mostly put on the true relative position (paragraph number 36) about said finder pattern behind the phase (316) which stops additional storage of a bit image (42A) display (paragraph number 36).

[0068] One (AZTEC) of said the finder discernment algorithms The phase which derives a number of sets (paragraph number 59) which show whenever [isolation / of each bit of continuation digital display (42A) to said digital display (42A)] (paragraph number 59) (paragraph numbers 51-59), The method according to claim 13 of providing the phase (paragraph number 49) which continues and compares the set of said number in order to identify the digital display (42A) which has the bit of whenever [highest isolation] (paragraph number 61).

[0069] One of said the component programs for finder discernment A number of sets (paragraph number 59) which show whenever [isolation / of a digital component] (paragraph number 59) are drawn from continuation digital display (paragraph numbers 51-59). A bar code reader including the program (paragraph number 49) which continues and compares the set of said number in order that any of said display may determine whether to have the digital element which has whenever [highest isolation] (paragraph number 61) according to claim 21.

[0070] Said continuation digital display is a bar code reader according to claim 19 which is inspected and compared in order to identify the symbol structure (85) which memorizes with FIFO (paragraph number 31) and the subset of a continuation digital (bit) display cannot display by single digital (bit) display by this (304,306) and which was made like.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the approach and equipment which read and memorize to asynchronous the display which can decode-dimensional [1] or a two-dimensional (2D) bar code symbol about a bar code reader using the handheld computer reader equipped only with 1-dimensional (1D) image sensors in more detail.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] The 1-dimensional light bar code reader is known well technically. As an example of this kind of reader, it is Welch Allyn. There is a bar code reader currently manufactured by the shrine (Welch Allyn, Inc.) by the proprietary product name of "SCANTEAM 3000 series." These readers contain the UPC/EAN code currently used widely in the supermarket, and the microcomputer which can read the 1-dimensional (1D) linearity bar code symbol of Code39 grade. Such a 1D linearity symbol can read the symbol by one scan in alignment with the shaft, supposing it has characterized by having the information encoded by the width of face of Bar and a tooth space only in accordance with one shaft and scan data are measured in resolution high enough.
[0003] In order to enable it to encode the data of a large quantity to one bar code symbol, many 1D stack bar code notation notations including PDF417 of a publication were developed [with an United States patent number / No. (artificer: Allais) 4,794,239 / with a number / Code49 and the United States patent number No. (artificer-avlidis, et al.) 5,304,786 / of a publication]. for a stack symbol's reconfigurating the whole message from a break and this symbol in two or more trains whose each is one D bar code patterns in itself about coded data -- all these trains -- or all must almost be scanned, it must decode and, subsequently this must be connected. The scan in this case is attached only to one dimension, and requires still comparatively high resolution, and a multiplex scan is needed for reading the whole symbol.

[0004] The 3rd bar code notation NOT-AND operation notation called a free scanning direction and two-dimensional (2D) matrix notation NOT-AND operation notation which offers larger data density and capacity compared with 1D notation NOT-AND operation notation was developed. 2D matrix code encodes data as a light-and-darkness cel within the regular-polygon matrix accompanied by a graphic form finder (graphical finder), bearing, and criteria structure. Generally it is required that the image with which these matrices are recorded by 2D image with which the target field was memorized, i.e., the level resolution with the almost same vertical-related both, should be decrypted.
[0005] In the "exaggerated ZABERUTO" (over the belt) (for conveyors) reader of a publication, 2D image of a migration symbol is read [with an United States patent number / No. (artificer-ierce, et al.) 4,634,850] in a series of 1D slices by 1D image sensor using the exact information about a motion of a conveyor or an article. 2D image sensor by which a well-known handheld computer 2D image reader picturizes the whole symbol at once -- or although any of 1D image sensor which picturizes one slice of a symbol at once are needed, 1D image sensor needs the wheel for synchronizing with motion and/, or a belt. Since a symbol conveyance front face smooth [this type of 1D image reader] and flat is needed, an available solution is not offered in the large range to the problem referred to as read and recording 2D bar code symbol which can be decoded certainly and efficiently. On the other hand, 2D image reader is attached comparatively at an expensive price.
[0006] Therefore, the easy and cheap handheld computer bar code reader which can be used without being able to read both 1D and 2D bar code symbol, and requiring a synchronous element or a signal is needed.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] According to this invention, 1D image sensors are used and the improved bar code reader which can read both 1D and 2D bar code symbol is offered. This bar code reader operates a bar code symbol according to 1-dimensional-like and the new approach of picturizing to asynchronous, and it is improved so that the digital display of one or more picturized slices of a bar code symbol may be read and memorized. As for these one or the digital display beyond it, in the case of 1D linearity symbol or 1D stack symbol, it is desirable to include the "timer count" display of the picturized slice, i.e., the display which recorded the count of generating of the transition (transition) produced during the slice. As for these slices, it is desirable to have the resolution which enables exact decode of the information which crossed all the code bars of symbol each train, and extended, and was encoded by the symbol.
[0008] In the case of 2D matrix symbol, these digital display constitutes the display which recorded each data element of the "bit image" of the picturized slice, or a "map bit" (bit mapped) display, i.e., the picturized slice, or the location of a bit. Moreover, when considering the bit image display (it is hereafter called "fatbits" for short in many cases) which plurality follows as a whole, they are methods with the bit near the method of the location in the physical space of the printed symbol which forms the symbol, and include the display (mapped) memorized or mapped by room. Since there is such close relation, if a finder pattern is identified once and the location is defined, the fatbits read and memorized can be used and decoded by the almost same method as 2D image read and memorized by 2D bar code reader.
[0009] The bar code reader by this invention can be used for it at both 1D and 2D bar code symbol, if the important thing is equipped with the software which can distinguish the various bar code notation NOT-AND operation notation with which it is used. When distinguishing 1D and 2D symbol, a reader will decode a symbol using one or the timer count display beyond it including the software which distinguishes 1D bar code symbol and 2D bar code symbol, if a symbol is a 1D symbol. When distinguishing various 2D symbols, a reader will decode a symbol using the memorized fatbits, if a finder pattern is recognized including the software which can explore continuously the existence or nonexistence of the finder pattern by which 2D bar code notation notation with which versatility differs is characterized. these two results have the substantial bar code reader of this invention in both timer count and fatbits about an object symbol -- it is attained easily [generating in the real time] simultaneous.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] As stated in more detail below, one of the important advantages of this invention is a point equipped with the capacity to decide when data reading is stopped from 2D symbol only based on the information included in the picturized continuous slice or continuous scan. This invention has realized this capacity by investigating substantially the fatbits of the slice picturized continuously in the real time in order to know the existence or nonexistence of the various finders used with 2D bar code notation notation. In these finders, it is Data. The "peripheral" (peripheral) mold finder used with the Matrix notation notation, Code There is the "central" (central) mold or "bull ZUAI" (bull's-eye) mold finder currently used with the "waist band" (waistband) mold finder used with the One notation notation, Maxicode, and an Aztec notation notation. The notation notation described at the end is indicated by the United States patent application number 08/No. 441,446 of the May 15, 1995 application which entitles "Two Dimensional Data Encoding Structure and Symbology For Use With OpticalReaders."
[0011] According to the bull ZUAI mold notation notation, existence of central FAINDA is recognized with the advent of the figure pattern which is led from the above-mentioned fatbits which carries out continuation and which is easy to recognize using the new finder discernment algorithm described below. According to a "peripheral" mold and the "waist band" mold finder, a finder is Data. Matrix and Code It is discriminable with the well-known finder discernment algorithm about an One notation notation. When carrying out automatic discernment of the symbol with one or more finder molds, these finder discernment algorithms can be applied as a candidate algorithm succeeding alternation until discernment is actually successful and decode becomes possible.
[0012] In the suitable example of the approach by this invention, the advantage has been acquired from the following data. That is, in order to change the video signal over 1D slice of a symbol into a "timer count" display, they are the data of saying the programmed control circuit device in which it operates with the timing signal of constant frequency that many 1D bar code readers have already contained. These timer count display of a symbol is substantially generated in the real time to each of the continuation slice of a symbol, when moving a reader manually so that a symbol may be crossed. In this way, these generated timer count display is memorized in the location which followed timer count room. These timer count display uses an easy well-known conversion algorithm, is changed into corresponding fatbits, and, almost simultaneously with this, subsequently to image memory space, is memorized. Thus, the approach by this invention is carrying out the maximum utilization of the possible advantage of the capacity of the existing 1D bar code reader so that both 1D and 2D symbol can be distinguished and decoded by the existing 1D bar code reader. However, as long as it is not so important to use the advantage of the existing bar code reader capacity, a reader may be designed so that a timer count and a bit image signal may occur that it is simultaneous and independently.
[0013] When it turns out that a reader is used for reading of only 2D bar code symbol, it is not necessary to include the processing phase (or circuit device) of performing discernment and processing of 1D bar code symbol in the approach (or equipment) of this invention. Therefore, in the example in the case of the latter, generating of a timer count display poses a selection problem of whether to include it according to whether it is useful for generating of the fatbits used for 2D bar code symbol. In the example in the case of the latter, the processing phase or program part used only for discernment and processing of 1D bar code symbol may be omitted.
[0014] according to the 2nd description of this invention, digital display will be substantially memorized by both above-mentioned memory in the real time with FIFO (first in-first out basis) with the display of the old slice shifted through memory (or -- at least -- an address pointer -- related), if the display of a new slice is memorized. If the terminal point of room is arrived at, the old slice display will be reinputted at the starting point of room. Consequently, two rooms will contain two read symbols list ** which one says as a timer count display and another says as fatbits and through which it circulates. The newly received set of a timer count display will be promptly decoded, if it is investigated when it arises, and they show existence of 1D symbol. If this decryption is not successful and the possibility of the existence of 2D

symbol is shown, fatbits will be investigated in order to decide whether discernment and positioning of a finder are possible. When a finder is identified and positioned, the part of the symbol picturized next is known. The processing which finds this finder continues the image pick-up of a symbol until sufficient symbols list ** required to decode a symbol is memorized.

[0015] Then, fatbits is selectively reorganized so that both each data bit and a finder pattern may be located in a true relative position mutual [these] (for example, the re-writing or the re-address in different sequence). Although this is carried out within image memory, as long as that image memory space is too small, this reorganization may be performed in the process in which fatbits is moved from image memory to timer count memory. In any case, the bit image obtained as a result is in the condition that it can decode using the decode algorithm relevant to the notation notation shown with the mold of the found-out finder.

[0016] He is trying for this invention to have the point [similar] of a certain 1D bar code reader and many from the former except for the following points in the field of equipment. That is, about how to take the timing of equipment, memory structure, and the programming method, it has changed so that equipment can be used according to the approach which described the outline above. Furthermore, if it says in detail, the equipment of this invention contains 1D bar code reader from which only sufficient amount to picturize many continuation slices of a symbol increased the rate of a clock signal, when crossing a symbol and moving it. Furthermore, with the memory structure of a reader, the above-mentioned room is corrected so that the timer count relevant to these slices and the storage operation of fatbits, and shift actuation may be enabled. After memorizing a sufficient number to identify and decode the notation NOT-AND operation notation about the programming method finally based on the mold of the finder currently used there if it corrects so that generating and storage of fatbits may be harmonized in order to distinguish 1D and 2D bar code notation NOT-AND operation notation, and 2D notation NOT-AND operation notation is used of digital display, he is trying to stop the image pick-up of a symbol. (Since error correction data are encoded by 2D bar code symbol with the message data, a point for it to be careful about the point described at the end here will be a point that a message can sometimes often be decoded thoroughly, even if a part of symbol is lost) . Since the function which these corrections bring about is already described in the outline of the point about the approach of this invention, repetitive explanation here is omitted.

[0017] About other objects and advantages of this invention, it will become clear from the following publications and a drawing.

[0018]

[Embodiment of the Invention] Drawing 1 shows the block diagram of the bar code reader of the type suitable for operation of this invention. This bar code reader will be Welch Allyn if correction of a certain extent mentioned later is performed. You may be the model ST-3000-22 mold 1D bar code reader put on the market at the shrine (Welch Allyn, Inc., Skaneateles, New York).

[0019] This bar code reader contains the lighting system possessing two or more 660nm light emitting diodes 16 which illuminate the narrow strip or narrow slice of width of face of a bar code symbol 18. Since the optical focusing arrangement 19 of a publication is provided [with an United States patent number / No. 5,291,008 / transferred to the applicant for this patent], the reader 10 is described for reference. the optical focusing arrangement 19 -- the light-receiving way 14 -- meeting -- the reflected light from a bar code symbol -- the charge coupling mold 1D image sensor 17 top -- condensing -- or image formation is carried out. A sensor 17 generates the analog signal which shows optically the content of the perfect slice of the bar code symbol which can be read. This analog signal is supplied to a digital disposal circuit 20, and this digital disposal circuit performs signal conditioning and digitization processing using the clock signal received from a RF timing signal or the clock input line 23. Since this digitization processing is performed [with an United States patent number / No. 5,294,783 / of an applicant for this patent] using the analog reconstruction circuit of a publication, it states for reference. The video signal display obtained as a result of the image pick-up of a slice is supplied to the control circuit device 30 in which drawing 1 was programmed through the output line 25.

[0020] The programmed control circuit device 30 plays various roles required for actuation of a reader, possesses the MC68HC11 microcontroller / microprocessor of Motorola, Inc. (Motorola), and contains the central-process unit 40 which has 64 K bytes of address space. This microprocessor contains a serial and parallel I/O, interrupt logic, an oscillator, and clock logic. As for the microprocessor 40, access is possible to 8 K bytes of static random access memory (SRAM) 42, and 32 K bytes of read-only program memory (PEROM) 45. The capacity of a microprocessor 40 is Welch Allyn. It is raised by the multifunctional application specification integrated circuit (ASIC) 35 put on the market by the goods number 21203276-01 from the shrine. As shown in drawing 1 , ASIC35 has the four main functional subunits or a block. Although the clock control subunit 43 makes easy a change-over of rate of scan 50,100,200 scan / second of image sensors 17, in this invention, only the rate of a scan of the latter, i.e., 200 scans / second, is used. The memory management subunit 46 (MMU) offers memory management capacity. The timer / DMA subunit 48 linked to a digital

disposal circuit 20 automate image reading for the next processing. Finally, the interface subunit 44 works through a line 37 as a RS-232 communication link interface for a bar code reader 10. ASIC35 and its subunit enable it to concentrate the means on a decryption of the data which the microprocessor 40 read from the bar code symbol. ASIC35 is controlled by the microprocessor 40 through the suitable bus 39 as a whole.

[0021] The timing of the circuit of drawing 1 is controlled by ASIC35 based on the timing signal received from Xtal 49. Frequency of 7.3728MHz contained in 3000 to model ST22 bar code reader before repair in order to deal with the high rate of an image sampling required to raise the engine performance of a reader and read a two-dimensional bar code symbol About Xtal, it is the frequency of 14.7456MHz. It transposed to Xtal. The following were used for repair of others to the basic model ST 3000-22.

[0022] SRAM42: 70ns of lot number CXK5864BM-70L put on the market from Sony Corp. (Sony Corp.), 8Kx8 CMOS RAM.

[0023] PEROM45: 90ns of lot number AT29C 256-9 put on the market by ATMEL ROM.

About above-mentioned repair, the activity of a RF timing signal is the most important for this invention, and other repair is for ensuring dependability of the circuit actuation in this RF.

[0024] The firmware (firmware) in PEROM45 includes the program memorized for the microprocessor 40. The part of the program constituted in PEROM45 is the usual thing, and is a part as which a bar code reader 10 is operated as a usual automatic discernment reader to a linearity bar code symbol. Speaking generally, firmware's 60 containing the four main program segments, as shown in drawing 2 . The multisystem function manager directed by the reference number 62 includes functions, such as an I/O monitor between control of initialization of volatile hardware and a memory area, a scan, and decryption actuation, sequence-izing and a bar code reader, an operator, and an external device, and maintenance.

[0025] The decryption function (decoding function) directed with the reference number 64 is attained through some phases. The preliminary test about the existence or nonexistence of 1D bar code symbol is performed to the beginning. If there is a 1D linearity symbol, a decryption of a symbol will be tried until a decryption of a symbol is successful about the timer count display of a slice. For this object, it comes out enough by 1 timer count display of a symbol, and there are many a certain things. When it is shown that there is a 1D stack symbol to which the stack of the display was carried out further, this procedure is repeated until all the trains of a symbol are decoded. If it becomes clear that a symbol is a 2D symbol, the symbol will be substantially investigated about the continuation fatbits of the picturized slice which is memorized by SRAM42 on real time. In the meantime, a display is investigated in order to identify the mold and location of a finder pattern to this display. This discernment is easily performed by the following data. That is, it is because much fatbits can be used simultaneously, so the recognition from only one fatbits and recognition of DS like the finder whose discernment is impossible are attained. If a finder is decided, additional fatbits will be memorized until it memorizes the fatbits of sufficient many to decrypt a symbol. Subsequently, memorized 2D image is decoded using the decryption algorithm of the type suitable for the symbol used for encoding a symbol.

[0026] An image top is run for a scanner 1 time or more than it until it usually carries out the trigger (or automatic scanning mode set) of the user in actuation of a reader, an alarm tone (for example, beep sound) can be heard and decode information is outputted (a sweep is carried out). Moreover, in this case, a user may specify manually whether 1D and 2D code should be read, and may place it, and can also decide automatically by the reader.

[0027] The menu facility which a reference number 66 shows is a routine specially answered and called to a decryption of a bar code symbol, and is the so-called bar code "a menu" which sets the non-volatile bit or value in the configuration field where PEROM45 was specified, and manages-izing of many operating characteristics of a scan of a bar code reader 10, for example, a rate, the amount of alarm tones, a mode of operation (hand control or automatic trigger), and specific bar code notation NOT-AND operation notation which can be decoded.

[0028] Communication facility 68 is a function to operate hardware, and contains the protocol required to distribute scan data to attachment. A bar code reader 10 can support many communications protocols and interfaces including a terminal, a keyboard wedge, etc. of a laser output, OCIA, OCR, RS-232, and various marketing.

[0029] If the circuit device of a reader and the point about the above-mentioned correction to programming are removed, a reader 10 will be a reader of the type which can get by this contractor in a commercial scene, and is understood. Therefore, it omits explaining further here about drawing 1 and the circuit device of the graphic display to 2. Drawing 3 is the enlarged drawing of SRAM42 showing how SRAM42 is organized as an object for operation of this invention. In the example of the graphic display to drawing 3 , 8 K bytes of room included in SRAM42 is divided into three groups. That is, it has about 3.7 K bytes of the 1st room, i.e., image memory space 42A, 4 K bytes of the 2nd room, i.e., timer count room 42B, and the 3rd room, i.e., the capacity of 0.3 K bytes, and it is divided into the group of accessory room 42C used as a set of the general-purpose register for the preparation facilities (housekeeping functions) of the usual

microprocessor while being used as a "connectivity (connectivity)" register in the phase of identifying the finder pattern of a symbol. Please understand not interfering, even if the number of these groups is only an example of a type, these rooms may be on the same chip and it is on a separate chip.

[0030] In the suitable example of this invention, this 2nd room 42B is used for receiving and memorizing the continuation timer count display about each slice of the bar code symbol picturized when crossing a bar code symbol and moving a reader 10 manually by the FIFO (first in-first out) method. In the case of 2D symbol, migration of this reader may be asynchronous and may be good, and if the migration direction is picturized possible [decode of a symbol] enough along that direction, it may be what kind of direction. However, in the case of 1D symbol, migration of a reader may be asynchronous similarly, but each code bar of a symbol must be performed within the limits of the direction included in a timer count display. From 1, zero, the video signal from a digital disposal circuit 20 of the number contained in each timer count display is the number of the timing pulses generated every, whenever it passes or changes to 0-1. The data from the video signal of the picturized slice are changed into the timer count display which corresponds how, and it is shown in drawing 8 and drawing 9 whether subsequently to timer count memory 42B it memorizes.

[0031] Similarly, the 1st room, i.e., image memory space 42A, is used for receiving and memorizing with FIFO the continuation fatbits about each slice of the bar code symbol picturized when crossing a bar code symbol and moving a reader 10 manually. Although such fatbitses differ in the timer count display and format, they include the same information substantially. Conversion to other formats from one format can be performed using a known conversion algorithm. In the suitable example of this invention, the fatbits of each slice is drawn from the timer count display corresponding to it using an algorithm as shown in drawing 8 and drawing 9 . This conversion can be carried out because the timer count generating circuit device of 1D reader of existing which performed the minimum correction, and programming can be used. However, still more generally the fatbits of the slice by which the bar code symbol was each picturized can also be drawn from a direct video signal. While a reader crosses a bar code symbol and moves, a series of examples which show how fatbits of each continuation slice "is shifted" through image memory 42A are shown in drawing 7 (A), (B), and (C).

[0032] Drawing 4 and drawing 5 are drawings having shown the bar code reader by this invention, and the package which marked several examples of the bar code symbol of the type which this reader can read together. 1D linearity bar code symbol 72, 1D stack symbol 78, and the 2D bar code symbol 76 are contained in these examples. If there is no limit about resolution, memory, or signal processing in a bar code scanner, all the symbols of a graphic display here can be read with a scanner in all the directions, i.e., what kind of direction, in principle. Since comparatively low resolution is required along with biaxial [biaxial and the reader which designed this omnidirectional reading as such symbols in the case of 2D bar code symbol cross at right angles mutually], it can attain easily. In the case of 1D bar code symbol, since information is encoded by the location of the edge of the code bar of a symbol, the high resolution only in alignment with the horizontal axis of a symbol becomes important. With the need for picturizing all the code bars in the slice each picturized, this will place a practical limit about the range of the direction which can read 1D symbol. So, although both this inventions can read 1D and 2D symbol, it serves as perfect omnidirection nature from the reasons of actual only to 2D symbol.

[0033] Drawing 6 , drawing 7 , drawing 8 , and drawing 9 show how 2D bar code symbol using above-mentioned Aztec notation NOT-AND operation notation is read by the approach and equipment by this invention. The line segment (1) of drawing 6 , (2), and (3) express various 1D slices picturized by the reader, when the 2D bar code symbol 80 is crossed and a reader is run (the sweep was carried out). As shown in drawing 8 and drawing 9 , the each picturized slice forms a video signal 82. Sequential storage is carried out in each location in memory 42B which the timer count showing the count of transition generating between the image elements said from black to white and from white to black is measured continuously, and works as timer count memory. If the timer count display of each slice is recorded on timer count memory 42B, the timer count data of a precedence slice will be changed into the fatbits of the slice, and will be recorded on each location in memory 42A which works as image memory.

[0034] In the suitable example of this invention based on corrected 1D reader, conversion to the fatbits which corresponds from a timer count display mentioned above is carried out by the microprocessor 40, and storage of a timer count display and fatbits is processed by the timer and DMA subunit of ASIC35. Since there are only all 8-K byte rooms of SRAM42, the amount of rooms which can be used for storage of a bit image is restricted to about 3.7 K bytes. Consequently, the bit image built by the example of drawing 1 becomes comparatively low resolution, i.e., the resolution of 170 lines to which each changes from 176 bits. However, it can be increased by this resolution if needed by increasing the storage capacity of SRAM42, or increasing the number of the optical response elements of/or the 1D sensor 17, or raising the frequency which investigates a video signal about/or transition generating.

[0035] The fatbitses 81, 82, and 83 of drawing 7 (A), (B), and (C) express the content of image memory 42A after a

reader picturizes the symbol slice (1) of a symbol 80, (2), and (3), respectively. After the location of a "stop" is being fixed about the location of "FAUNDO" and the pattern appropriate for a finder is checked by drawing 7 (B) and (C) here, the scan of the specific number N is made. As for drawing 7 (B), the scan of N book shows that the address pointer P has not arrived at a "stop" location yet by unfinished, and drawing 7 (C) shows that the scan of N book was completed and the address pointer P arrived at the "stop" location. If image memory 42A fills to the termination as shown in drawing, since the input pointer P returns at the starting point of room, each slice of a bit image will mind image memory, and will shift or circulate through it effectively. The same circulation as this takes place also about the timer count display memorized by timer count memory 42B. The situation of these display circulation is shown as a closed loop drawn on drawing 9 with the broken line.

[0036] If the fatbits of a symbol 80 is picturized and memorized, analysis (it mentions later) for investigating whether fatbits has a finder pattern will be performed. If 2D symbol is using the Aztec notation notation, this finder pattern will include the shape of drawing 6 , drawing 7 , and a nest which gave the reference number 85 to drawing 8 , and was drawn by black and white, i.e., a concentric square set. Drawing 7 R> 7 (B) and (C) show the symbol images 82 and 83 containing this finder pattern. If this finder pattern is found, in order to memorize resolving of sufficient symbol to decode a symbol certainly, data are processed from the predetermined number of the additional slice of a symbol, and it is inputted into timer count memory 42B and image memory 42A. Since the location of the image which could be related with the boundary (namely, the address pointer P) of room cannot be predicted in advance, an image may be memorized by two parts as shown in the bit image 83 of drawing 7 (C). If desirable, in order to relieve decode processing, by reorganizing the fatbits memorized by image memory (formation of re-sequence), these two parts are mixed and it is good also as a single image. The object of this reorganization is that the image of the bar code symbol in which perfect decode is possible, i.e., the bit of bit image display, forms certainly substantially the image located in those true relative positions in room about a finder as a whole. Therefore, the bit which adjoins mutually in the physical space containing a printing symbol will adjoin mutually also in the room containing a corresponding storage image.

[0037] When image memory space 42A is too small for above-mentioned reorganization-izing, the same result can be obtained also by shifting an image to timer count memory as a perfect unit which has all the parts of the image containing the finder in the same side as the pointer of timer count memory. Although such image shift will overwrite the data written in timer count memory from before, since the data currently written in timer count memory are not required any longer, this address processing does not pose a problem.

[0038] Although the above-mentioned reorganization about the image of the read bar code symbol is desirable, please understand that it is not what constitutes the essential part of this invention. Although this kind of reorganization is desirable in being required for a decryption algorithm of a certain kind, it is because it is not important except [its]. It is dependent on the class of finder pattern currently used for the bar code symbol whether such reorganization is required, or advantageous, is clear, and there is. [any] So, the reorganization of this invention is required for a decryption, or it supposes that reorganization of the bar code symbol image read when advantageous takes it into consideration, and reorganization in case the need or usefulness does not exist is not taken into consideration.

[0039] A series of trial which decodes the strange symbol as 1D linearity symbol or a 1D stack symbol, and when that trial is impossible, an above-mentioned image reading process identifies 2D finder, and is performed within the framework of an image-analysis process including a series of trial which decodes a symbol using this identified finder, or a type classification process, so that it may state in more detail here. It is made for by referring to the flow chart shown in drawing 10 and drawing 11 to have shown the all-inclusive image-analysis process best. It is made for by referring to the flow chart of a graphic display to drawing 12 and drawing 1313 to have shown the analysis part about 1D symbol best. Moreover, it is made for by referring to the flow chart of a graphic display to drawing 14 and drawing 15 to have shown the analysis part about 2D symbol best. In order to give precision and "relevance (connectedness)" to drawing, drawing 12 , 13 and drawing 14 , and two flow charts of the graphic display to 15 contain a part of drawing 10 and flow chart (drawing 12 , 13 and drawing 14 , on the broken line of 15) of 11 as induction to these flow charts.

[0040] Hereafter, the image-analysis framework summarized above is explained with reference to drawing 10 - drawing 15 . If it stands on drawing 10 and the flow chart of 11 first and returns and explains, image analysis will begin from the block 102 which asks a reader for trigger press standby. If a trigger is pushed, a reader will start the scan for which block 104 asks, and imaging of the storage slice by the timing device (if a trigger press is generated). Subsequently, a reader investigates whether the trigger is still pushed (block 106). If the trigger is not pushed, it gets to know that the reader is going to the scan before reading finishing and returning to a standby condition (block 102), and immobilization (disabling) (block 120) of a timing device. If the trigger is still pushed, it will wait for a reader till completion of the next scan slice (block 108), subsequently it will progress to block 200, and will start suitable image analysis.

[0041] If the block 200 described in more detail about drawing 13 exists, a processing phase required to decode 1D

symbol of which type is expressed, and if a reader reaches this block, it will try activation of this decode process. It continues this trial until this trial is successful and a perfect message is prepared, or until this trial fails in a reader. If a reader prepared namely, (block 112) judges a perfect message to be "data-preparation completion" (data ready), before immobilizing a scan and a timing device (block 120) and returning to a standby condition (block 102), a reader generates the beep sound demanded with block 118, and outputs the data.

[0042] As for block 112, a reader is turned to block 300, when a reader cannot decode a symbol or is not able to make a perfect message. This block 300 expresses the processing phase required to also decode what type of the inside which exists variously of 2D symbol. one reason which cannot carry out the data preparation (block 112) of the reason for performing this processing phase -- a symbol -- 1D symbol -- not but -- that is, it is because it may be 2D symbol. However, whether this is actually so then still remains as an object for decision. It says because there tended to be breakage or possibly it was going to read 1D symbol in the direction which a symbol is not allowed to the reason "whose data preparation" were not completed. Therefore, block 300 gives a chance to decode an object symbol as a 2D symbol to a reader, before a reader gives up reading and returns to a standby condition.

[0043] If the processing phase demanded by block 300 is completed, if a reader judges whether the message which can be decoded was prepared (block 116) and prepared, it will output the data and will return to a standby condition. If the message which can be decoded cannot be prepared, before a decryption becomes possible, still much more imaging of 2D symbol may be the thing which is the need. Consequently, if a reader repeats an above-mentioned analysis process about an additional scan slice and it is made, it will output a message and will return to a standby condition, until it is returned to block 106 and can prepare the message in which perfect decode is possible.

[0044] The above thing shows only then outputting eventually the message which can be decoded from 1D and 2D symbol, if read from the direction which reading of a symbol was possible for the analysis processing shown in drawing 10 and the flow chart of 11, and was allowed. Under these circumstances, a reader determines eventually which symbol type and subtype there were as a matter of fact by deciding whether it became the message which can decode which symbol type and subtype.

[0045] Drawing 12 and 13 show the process (under a broken line) required to decode the data encoded there and collect into a message, when there is any of 1D linearity symbol or 1D stack symbol they are. These processes use drawing 10 and the process of the elimination same with having described above in relation to 11. Furthermore, if it says in detail, it will be determined whether this flow chart has 1D linearity symbol or 1D stack symbol by trying a decryption of one symbol first and determining whether one or other symbols exist by whether subsequently the decryption which tried the decryption of other symbols and tried was successful.

[0046] Since 1D automatic distinction Argo RUZUMU (namely, algorithm which discriminates from any subtypes from which 1D linearity symbol differs variously, and can be decrypted) is known well technically, it omits what is described in detail here about the processing phase included in performance of the treatment demanded by the blocks 202-210 of drawing 13 . Similarly, since the suitable algorithm for a decryption of 1D stack symbol is indicated by the Allais patent referred to before, it omits what is described in detail here about the processing phase included in performance of the treatment demanded by the blocks 212-214 of drawing 13 .

[0047] The finder pattern of the different type and the data encoded by 2D symbol which has finder patterns, such as a central finder (central finder) and waist band finder (waistband finder) and a peripheral finder (peripheral finder), especially (if it was) are decoded to drawing 14 and 15, and the processing phase included in the processing summarized in a message is shown in them (under a broken line). activation of this processing -- setting -- drawing 14 R> -- 4 and 15 have adopted the same elimination processing with having described drawing 10 and 11. Furthermore, if it says in detail, after changing a current timer count display into corresponding fatbits (block 302), it judges whether according to a demand of blocks 304 and 306, a reader relates current fatbits with the fatbits of some precedence scan slices, and has a pattern like a finder. This judgment can be performed by applying the fuzzy (fuzzy) logic pattern recognition technique known well, the algorithm with which the publication is carried out to the United States patent number 5,401,949th (artificer: Ziemacki), some the candidate of a finder discernment algorithm, for example, an image-processing algorithm. If the pattern appropriate for a finder is found, a reader will read the display of sufficient addition to decode a symbol. It is carried out using this reading even in a scan counter and the related control block 308-316. After this is completed, according to a demand of block 318, a reader determines bearing of 2D image and tries the decode. If this decryption trial is successful, a reader will output that data and will return to a standby condition (block 320). If it finishes unsuccessful, a reader will return to block 106, in order to try a decryption once again.

[0048] Inspection of the fatbits set about the type of the finder (supposing it is) which is there includes the application of elimination processing using the same algorithm used by the conventional reader to the located finder. For example, Code The finder of the waist band mold which used the One symbol is AIM. USA Technology It can find out using the

algorithm stated to "(issuance number TSC 059) Uniform Symbology Specification CodeOne" of Group issuance. Similarly, it is Data. It can find out using the algorithm recommended by the creator, and the peripheral mold finder using a Matrix symbol is Maxi. The circular (circular) central mold finder which used the Code symbol can be found out using the algorithm recommended by the creator. In the case of the Aztec symbol, the algorithm especially advantageous to finding out a finder is developed. This algorithm is Maxi. It is fully effective also about the symbol using the central mold finder another type like Code. Since it generally is not accomplished now yet, the explanation about the latter algorithm is described about this here.

[0049] Inside, in order to find out small "island" (black field) within inside [of large "rake" (lake) (white field)], and "island" (island) a "rake" etc., each bit of a continuation slice is inspected using a central mold finder pattern. It is carried out by defining how each pixel has separated this inspection from the top chord of an image, and the side side, and the core of bull ZUAI (bull's-eye) clarifies by this approach. The rapid scan algorithm for finding out such bull ZUAI structure is explained below.

[0050] It is C so that intelligibly for a computer programmer. The following algorithms described by Code define the core of the high "isolation" (isolation) point in the image memorized, for example, bull ZUAI. First, the full contrast image (fully contrasted image) of the "n" pixel ("n"pixels wide) of 2D bar code is memorized by the l [x] and [y] array (0 <=x<n), and each element l [x] and [y] assume that it is what takes the value of 0 (pair white) or 1 (pair black). The single image frame (0 <=y<m) from 2D sensor is sufficient as this image, and the image (0<=y<??.) which carried out rolling-off and obtained continuously 1D sensor which moves about a target may be used for it.

[0051] First, the value of "level" (level) array L[x]"n" is set up. L is an integer without a sign here. L is initialized by the value of the best train of l. Namely, [0052]

[Equation 1]

```
for (x = 0; x < n; x++) L[x] = l[x][0];
```

[0053] The train of the following image is processed to L by the biplane scan one by one. Namely, [0054]

[Equation 2]

```
for (y = 1; y < m; y++)
{
```

[0055] first, L [x] which sets L of a high-order end equally to the value l of the high-order end in the train, and subsequently continues when scanning on the right from the left -- (a) -- the current value (from the upper train), or the value of the left-hand -- small -- setting -- subsequently -- (b) -- 1 will be added if it is necessary to make new L and its corresponding l into even number or odd number. It is C about this. If it expresses mathematically using Code, it will become as follows.

[0056]

[Equation 3]

```
L[0] = l[0][y];
for (x = 1; x < n-1; x++)
{   if (L[x-1] < L[x]) L[x] = L[x-1];
    if ((L[x] ^ l[x][y]) %2 == 1) L[x] = L[x] + 1;
}
```

[0057] Next, when returning from the right to the left, right end L is set equally to the right end value l, and subsequently subsequent L will decrease only 2 (or the multiple), if only 2 (or the multiple) has crossed the right-hand. Namely,

[0058]

[Equation 4]

```
L[n-1] = l[n-1][y];
for (x = n-2; x >= 0; x--)
{     while (L[x] >= L[x+1] + 2)  L[x] = L[x] - 2;
}
```

[0059] When processing of the data obtained from each scan performed from a train to a train one by one is repeated, the value of L begins to mean how the image field is isolated from the top chord and the side side. After processing the train which passes along the part of bull ZUAI, the value of a series of L in the near is as follows. : ... It is 2223333444555566655 544443333222.

The decision criterion of "the finder (namely, bull ZUAI) placed" is characterized as a continuous increment beyond four, four accompanied by the continuous reduction beyond it, or it in an isolation value. Maximum expresses the core of bull ZUAI. The scan (shown by the scan to the left from the above-mentioned right, however here as separated actuation) to L by the single state machine detects this condition.

[0060]

[Equation 5]

```
state = peakx = 0;
for (x = n-1; x ≥ 0; x--)
{       switch(state) {
        case 0:
        case 1:
        case 2:
        case 3:       if (L[x] < L[x+1])  state = 0;
                if (L[x] > L[x+1])  { peakx = x; state++; }  break;
        case 4:       if (L[x] > L[x+1])  peakx = x;
                if (L[x] < L[x+1])  state++;  break;
        case 5:
        case 6:
        case 7:       if (L[x] > L[x+1])  state = 0;

                if (L[x] < L[x+1])  state++;  break;
        default:
        }
 }
```

[0061] If this scan to L finishes it as "state" =8, point l [peakx] and [y] will become a candidate based on bull ZUAI. The examination which looks for possibility of the candidate who so has level higher than L that a true bull ZUAI core has isolation (isolation) of a record level is continued. If Variable peakl is initialized by zero at the beginning of a scan, the center position of the candidate bull ZUAI will be recorded as follows.

[0062]

[Equation 6]

```
      if ((state == 8) && (L[peakx] > peakl))
      {       peakl = L[peakx]; eyex = peakx; eyey = y;
      }
}
```

[0063] When the scan of a whole image is completed, "peakl" which is not the zero which show bull ZUAI (bull's eye) adjoins pixel l [eyex] and [eyey], and is found out. Moreover, after passing over the newest "peakl", in the case of the image which flows continuously, a suitable number of trains (for example, one half of an image buffer size) are read, and a scan is ended to it. This is the number "N" described about the above-mentioned block 308. This invention uses the method of reading the 2nd chosen so that reading may be ended by the scan of N individual, after passing over the newest "peakl." Analysis is continued so that higher peakl, i.e., the candidate more in character with based on bull ZUAI, may be found. When all the picturized slices are memorized and a finder is defined, a symbol will be in the condition that it can decrypt about a finder.

[0064] This contractor is good and it will just be going to understand that it is possible to add modification variously at a fine point, without deviating from the pneuma and the range of this invention stated to the claim although this invention has so far been described about some examples of a graphic display. In addition, it is as follows if the response relation between the one section of this application claim and the publication of a description is shown. One (AZTEC) of said the finder discernment algorithms The phase which derives a number of sets (for example, paragraph number 59) which show whenever [isolation / of each bit of said bit image (42A) display] (paragraph number 59) from a continuation bit image (42A) display (paragraph numbers 51-59), The method according to claim 5 of providing the phase which

continues and compares the set of said number in order to identify the bit image display which has the bit of whenever [highest isolation] (paragraph number 59).
[0065] Said finder discernment algorithm is an approach containing the 1st algorithm (AZTEC) which identifies a central mold finder pattern (paragraph number 49), the 2nd algorithm (CodeOne) which identifies a waist band mold finder pattern (paragraph number 48), and the 3rd algorithm (Data Matrix) which identifies a peripheral mold finder pattern (paragraph number 48) according to claim 5.
[0066] The approach according to claim 1 by which the storage phase of a continuation bit image display is carried out FIFO (paragraph number 31), it is related with a single bit image display ((1), (2), or (3)) this, and the predetermined set of a continuation bit image (42A) display is substantially inspected and compared the real time to the symbol structure (85) which is not discriminable (304,306).
[0067] The method according to claim 5 of providing the phase which reorganizes said bit image (42A) display (paragraph number 38), and makes the decryption easy after the phase (316) which stops additional storage of a bit image (42A) display. The method according to claim 5 of providing the phase of reorganizing said bit image (42A) display in order that the bit of a bit image display may form the bar code symbol image mostly put on the true relative position (paragraph number 36) about said finder pattern behind the phase (316) which stops additional storage of a bit image (42A) display (paragraph number 36).
[0068] One (AZTEC) of said the finder discernment algorithms The phase which derives a number of sets (paragraph number 59) which show whenever [isolation / of each bit of continuation digital display (42A) to said digital display (42A)] (paragraph number 59) (paragraph numbers 51-59), The method according to claim 13 of providing the phase (paragraph number 49) which continues and compares the set of said number in order to identify the digital display (42A) which has the bit of whenever [highest isolation] (paragraph number 61).
[0069] One of said the component programs for finder discernment A number of sets (paragraph number 59) which show whenever [isolation / of a digital component] (paragraph number 59) are drawn from continuation digital display (paragraph numbers 51-59). A bar code reader including the program (paragraph number 49) which continues and compares the set of said number in order that any of said display may determine whether to have the digital element which has whenever [highest isolation] (paragraph number 61) according to claim 21.
[0070] Said continuation digital display is a bar code reader according to claim 19 which is inspected and compared in order to identify the symbol structure (85) which memorizes with FIFO (paragraph number 31) and the subset of a continuation digital (bit) display cannot display by single digital (bit) display by this (304,306) and which was made like.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of a bar code reader suitable for carrying out this invention.
[Drawing 2] It is the instantiation-block diagram of a PEROM program block shown in drawing 1 .
[Drawing 3] It is the instantiation-block diagram of the SRAM block shown in drawing 1 .
[Drawing 4] It is drawing (the 1) showing the shipping container which attached a bar code reader, 1D, and 2D bar code symbol.
[Drawing 5] It is drawing (the 2) showing the shipping container which attached a bar code reader, 1D, and 2D bar code symbol.
[Drawing 6] It is drawing showing the bar code reader of this invention which crosses 2D bar code symbol and moves.
[Drawing 7] It is drawing showing the content of the image memory in the various phases which scan the symbol of drawing 6 .
[Drawing 8] It is drawing (the 1) showing the relation during the various displays of the data read in the slice of a bar code symbol.
[Drawing 9] It is drawing (the 2) showing the relation during the various displays of the data read in the slice of a bar code symbol.
[Drawing 10] It is the flow chart (the 1) which shows actuation of this invention.
[Drawing 11] It is the flow chart (the 2) which shows actuation of this invention.
[Drawing 12] It is the flow chart (the 3) which shows actuation of this invention.
[Drawing 13] It is the flow chart (the 4) which shows actuation of this invention.
[Drawing 14] It is the flow chart (the 5) which shows actuation of this invention.
[Drawing 15] It is the flow chart (the 6) which shows actuation of this invention.
[Description of Notations]
10 -- Bar code reader
20 -- Digital disposal circuit
30 -- Programmed control circuit
40 -- Central-process unit
42A -- Image memory space
42B -- Timer count room
42C -- Accessory room
72 -- 1D (one dimension) linearity bar code symbol
76 -- 2D (two-dimensional) bar code symbol
78 -- 1D (one dimension) stack symbol

[Translation done.]

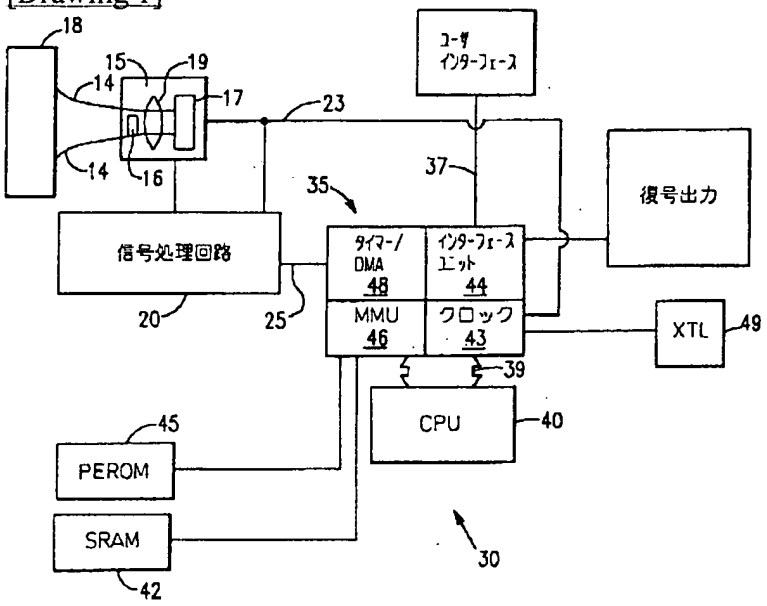
* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

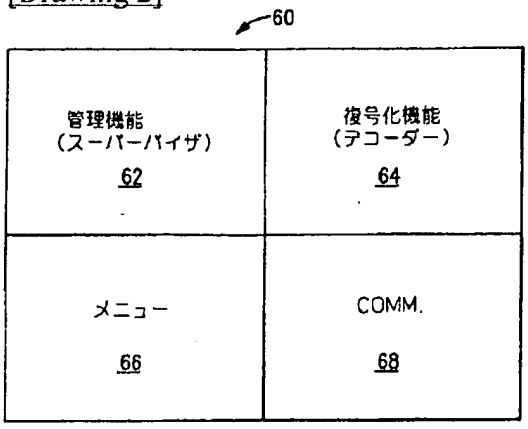
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

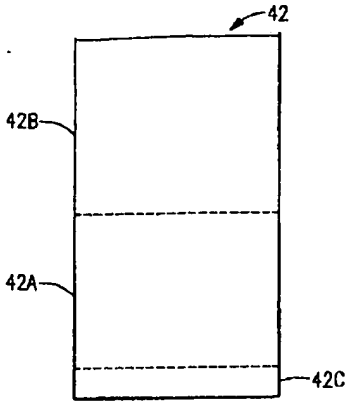
[Drawing 1]



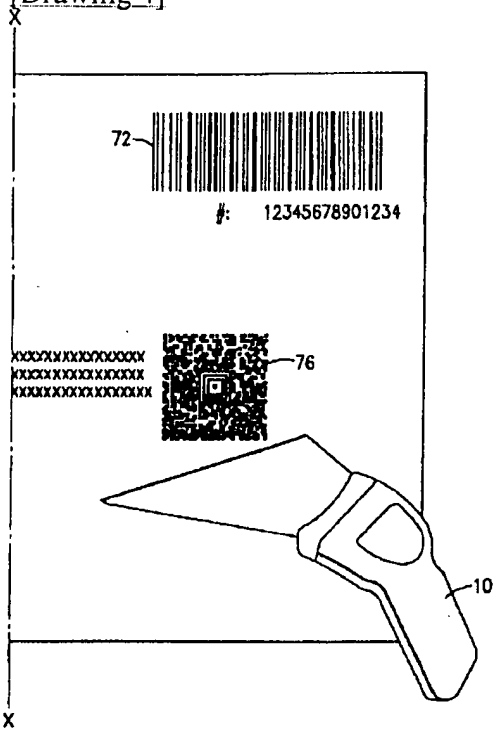
[Drawing 2]



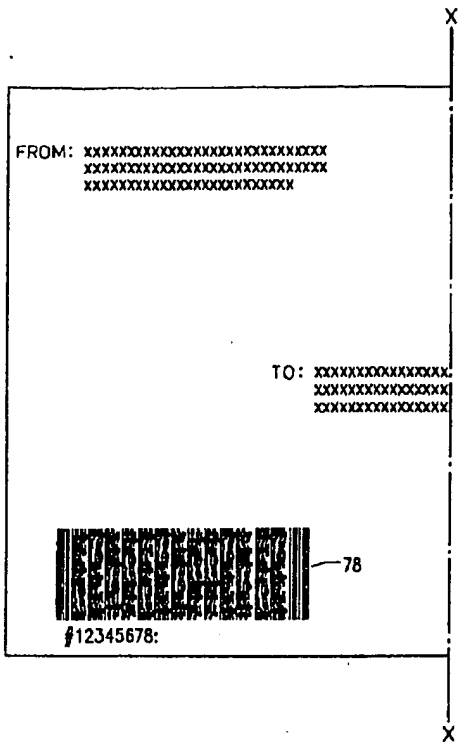
[Drawing 3]



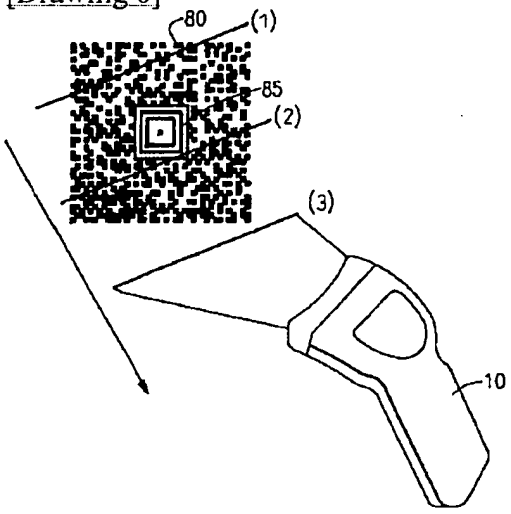
[Drawing 4]



[Drawing 5]

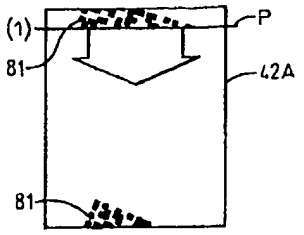


[Drawing 6]

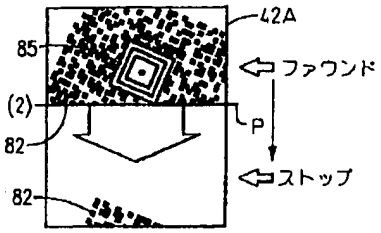


[Drawing 7]

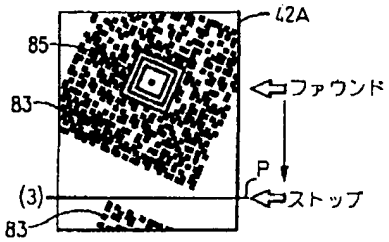
(A)



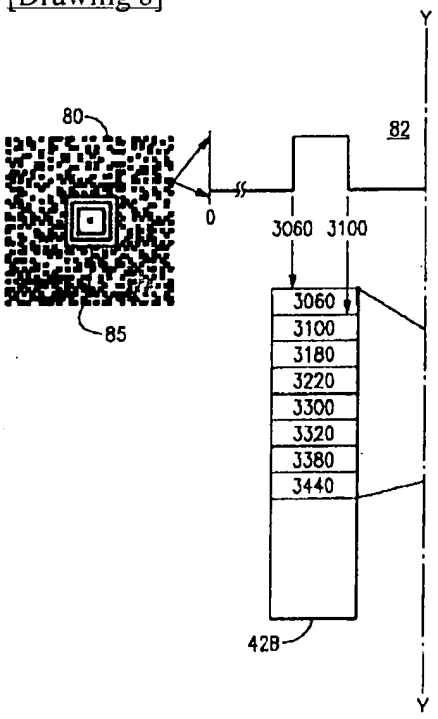
(B)



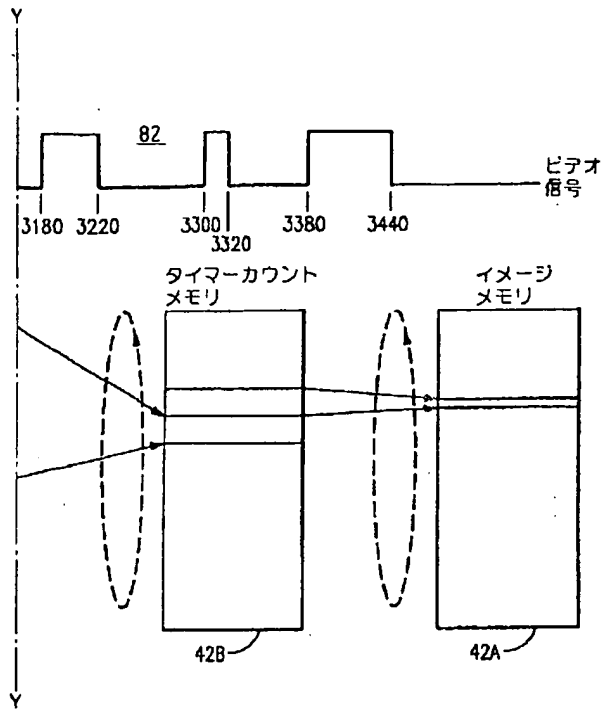
(C)



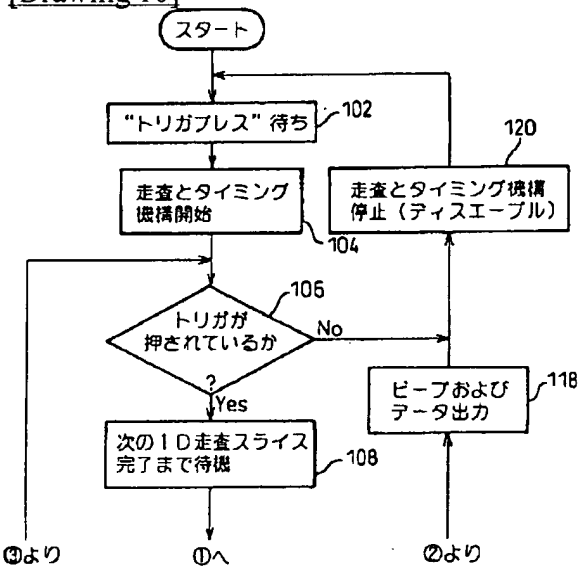
[Drawing 8]



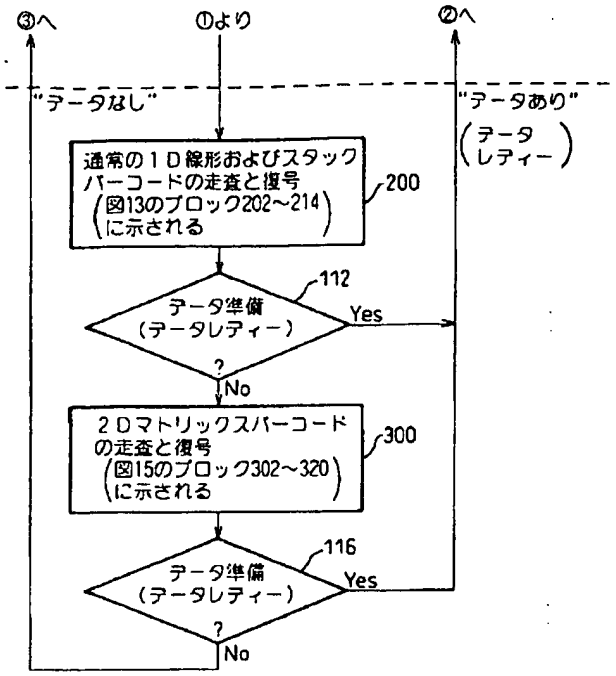
[Drawing 9]



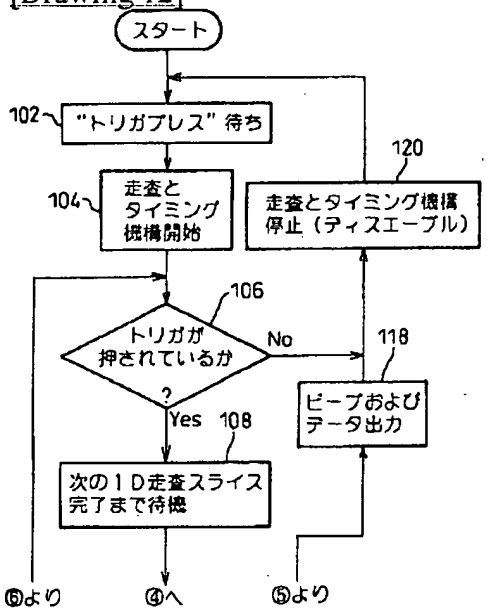
[Drawing 10]



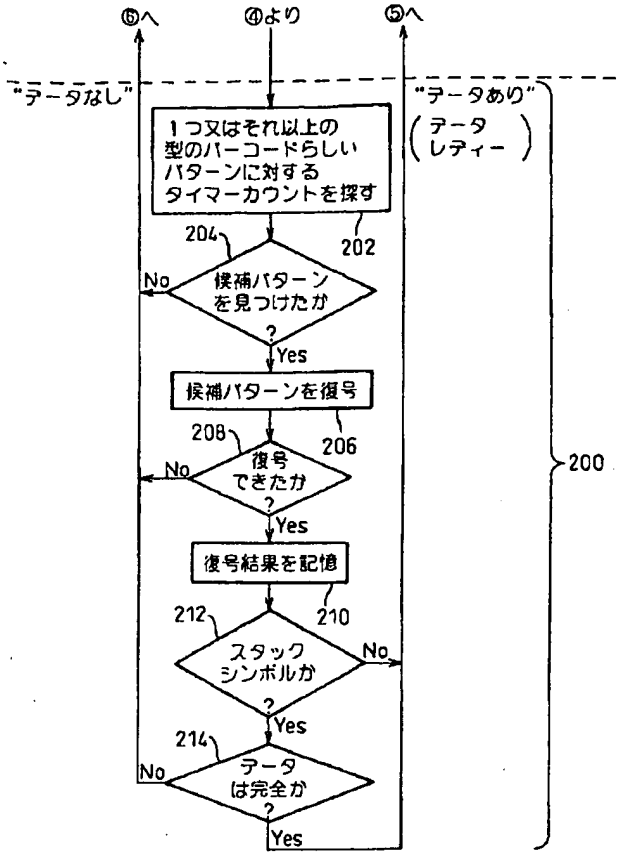
[Drawing 11]



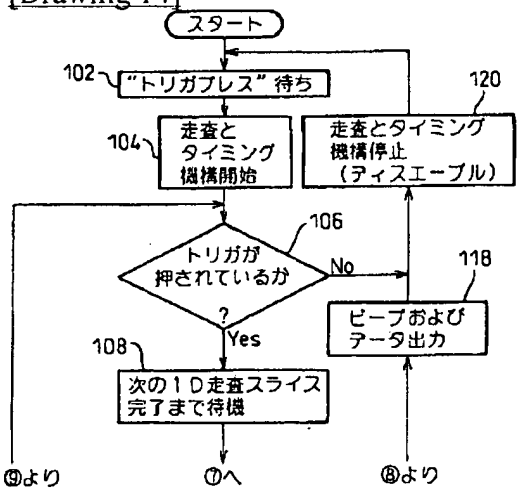
[Drawing 12]



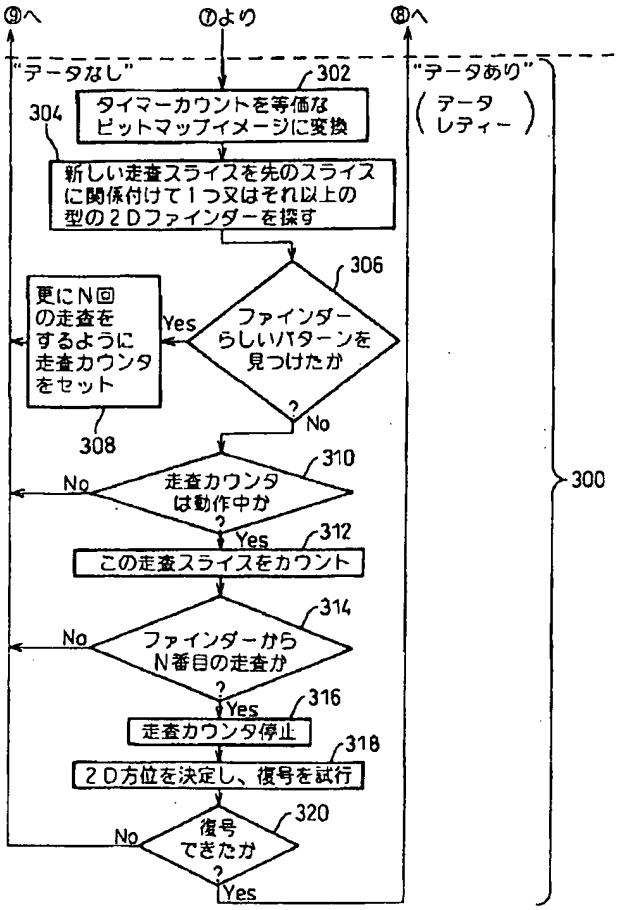
[Drawing 13]



[Drawing 14]



[Drawing 15]



[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law
[Category partition] The 3rd partition of the 6th category
[Publication date] July 15, Heisei 16 (2004. 7.15)

[Publication No.] JP,9-34982,A
[Date of Publication] February 7, Heisei 9 (1997. 2.7)
[Application number] Japanese Patent Application No. 8-159625
[The 7th edition of International Patent Classification]

G06K 7/10
G06K 7/00

[FI]

G06K 7/10 P
G06K 7/00 E

[Procedure amendment]
[Filing Date] June 20, Heisei 15 (2003. 6.20)
[Procedure amendment 1]
[Document to be Amended] Description
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[The content of amendment]
[Claim(s)]
[Claim 1]
1D slice ((1) of drawing 6 --) of 1D (72 or 78) or 2D (76) bar code symbol (72, 76, or 78) (2) or (3) are picturized and it is the digital display (a timer count) of this slice. Or it is the approach of reading and memorizing to asynchronous the display (83) which can decode said bar code symbol (72, 76, or 78) using the handheld computer bar code reader (10) which suits formation of a bit,
The phase of providing for said reader (10) the memory tooth space (42A, 42B) which memorizes the digital display of two or more of said slices ((1), (2), (3), etc.), and the phase which crosses said symbol (72, 76, or 78), is made to move said reader (10), and picturizes a series of 1D slices ((1), (2), (3), etc.) of this symbol,
The phase which forms a series of digital display (a timer count or bit) which corresponds from said slices ((1), (2), (3), etc.) of a picturized single string,
The phase of memorizing said digital display to said memory tooth space (42A, 42B) in the real time substantially,
How to provide the phase which continues said storage phase until it reaches number with the sufficient number of the memorized displays (1 - N) to determine the data encoded by said symbol (72, 76, or 78) from the memorized display.
[Claim 2]
the phase which forms said digital display -- said picturized slice ((1) --) The phase which forms (2) or (3) a timer count (42B) and a bit image (42A) display etc. is included. Said timer count display is used as digital display of the bar code symbol (72 or 78) decoded about a timer count (42B) display. Said bit image (42A) display is an approach according to claim 1 used as digital display of the bar code symbol (76) decoded about a bit image (42A) display.

[Claim 3]
When continuation digital display (a timer count or bit) arises substantially, the phase (202) of inspecting the continuation digital display is included further,
(i) To 1D symbol (72 78), it is related with one or the timer count (42B) display beyond it, and is an attempt about a decryption (206,208) of this symbol (72 78),
(ii) To 2D symbol (76), the location of the finder pattern (85) to a symbol (76) is checked. In order to identify, when it inspects continuously the bit image (42A) display of a symbol (76) (304) and the location of a finder pattern (85) is checked and identified The approach according to claim 2 of trying a decryption (318,320) of this symbol (76) about the bit image (42A) display memorized to said memory tooth space (42A, 42B).
[Claim 4]
The method according to claim 3 of providing further the phase (214) which repeats a decryption phase (206) until it defines whether this symbol is a stack symbol (78) and a non-stack symbol (72) (212), sufficient train of a stack symbol (78) will be decoded if it is a stack symbol (78), and it forms a perfect message when said symbol is a 1D symbol (72 or 78).
[Claim 5]
The phase of inspecting the continuation bit image (42A) display to a finder pattern (85) (304),
(i) Phase of memorizing two or more suitable finder (85) discernment algorithms (AZTEC, Code One, etc.) for each type (a waist band mold, peripheral mold, etc.) of a finder pattern (85) of discernment (304),
(ii) Phase which carries out sequential execution of said finder discernment algorithm in order to define what kind of finder pattern is used into said symbol (304-320),
(iii) The number (N) of the bit image displays memorized to said memory tooth space (42A, 42B) When sufficient number to decode the data memorized to said memory tooth space (42A, 42B) about the finder pattern (85) currently used by said symbol is reached, The method according to claim 3 of providing the phase (316) which stops additional storage (308) of a bit image (42A) display.
[Claim 6]
One (AZTEC) of said the finder discernment algorithms
The phase which derives a number of sets which show whenever [isolation / of each bit of said bit image (42A) display] from a continuation bit image (42A) display,
The method according to claim 5 of providing the phase which continues and compares the set of said number in order to identify the bit image display which has the bit of whenever [highest isolation].
[Claim 7]
Said finder discernment algorithm is an approach containing the 1st algorithm (AZTEC) which identifies a central mold finder pattern, the 2nd algorithm (Code One) which identifies a waist band mold finder pattern, and the 3rd algorithm (Data Matrix) which identifies a peripheral mold finder pattern according to claim 5.
[Claim 8]
The approach according to claim 1 by which the storage phase of a continuation bit image display is carried out FIFO, it is related with a single bit image display ((1), (2), or (3)) this, and the predetermined set of a continuation bit image (42A) display is substantially inspected and compared the real time to the symbol structure (85) which is not discriminable (304,306).
[Claim 9]
The method according to claim 5 of providing the phase which reorganizes said bit image (42A) display, and makes the decryption easy after the phase (316) which stops additional storage of a bit image (42A) display.
[Claim 10]
The method according to claim 5 of providing the phase of reorganizing said bit image (42A) display, in order to form the bar code symbol image with which each bit of a bit image display is mostly put on the true relative position about said finder pattern behind the phase (316) which stops additional storage of a bit image (42A) display.
[Claim 11]
It is the approach of reading and memorizing to asynchronous the display which can decode said bar code symbol (72, 76, or 78) using the handheld computer bar code reader (10) which picturizes 1D slice ((1), (2), or (3)) of 1D (72 or 78) or 2D (76) bar code symbol (72, 76, or 78), and suits formation of the digital display (a timer count and/, or bit) of this slice,
The phase which crosses said symbol (72, 76, or 78), is made to move said reader (10), and picturizes a series of 1D slices ((1), (2), (3), etc.) of this symbol,
The phase which forms a series of digital display (a timer count and/, or bit) which corresponds from said slices ((1), (2),

(3), etc.),
When said digital display (a timer count and/, or bit) arises substantially, in order to decide whether a symbol (72, 76, or '78) can decode as a 1D (72 78) symbol The phase of inspecting the digital display, the phase which will decode said symbol as a 1D symbol about one or the digital display beyond it (timer count) if decode is possible as a 1D symbol (72 or 78), and (206),
If decode is impossible as a 1D symbol (72 78), the location of 2D finder pattern (85) to said symbol (76) will be checked. In order to identify, when it inspects the set of said digital display (bit) and the location of a finder pattern (85) is checked and identified (306) How to provide the phase (318) which decodes said symbol as a 2D symbol (76) about a finder pattern and said digital display.
[Claim 12]
The method according to claim 11 of providing further the phase which repeats a decryption phase (206) until it defines whether this symbol is a stack symbol (78) and a non-stack symbol (72) (212), sufficient train of a stack symbol (78) will be decoded if it is a stack symbol (78), and it forms a perfect message when said symbol is a 1D symbol (72 or 78) (214).

[Claim 13]
The phase of inspecting the set of digital display (42A) to a finder (304),
(i) Phase of memorizing two or more respectively suitable finder discernment algorithms (AZTEC, Code One, etc.) identifying each mold (central mold and waist band mold etc.) of a finder pattern (304),
(ii) Phase which carries out sequential execution of said finder discernment algorithm in order to define what kind of finder pattern (85) is used into said symbol (76) (304-320),
(iii) The method according to claim 11 of providing the phase (308) which continues generating of digital display until it reaches number with the sufficient number of digital display (N) to decode a symbol (76).
[Claim 14]
One (AZTEC) of said the finder discernment algorithms
The phase which derives a number of sets which show whenever [isolation / of each bit of continuation digital display (42A) to said digital display (42A)],
The method according to claim 13 of providing the phase which continues and compares the set of said number in order to identify the digital display (42A) which has the bit of whenever [highest isolation].
[Claim 15]
Said timer count display (42B) is an approach according to claim 11 by which said digital display is used for decode of 1D symbol (72 or 78) including the timer count (42B) of said 1D slices ((1), (2), (3), etc.), and both displays of a bit image (42A), and said bit image display (42A) is used for discernment of 2D finder pattern (85).
[Claim 16]
the slice ((1) --) of 1D (72 or 78) or 2D (76) bar code symbol (18) 1D image sensors which generate the output signal which changes in response to the image of (2) or (3) according to the content of data included in this slice (17), It is the handheld computer bar code reader (10) which has the processing circuit (20) which changes this output signal into the digital display corresponding to said slice, and reads and memorizes to asynchronous the display which can decode said bar code symbol (18),
The programmed control means which answers said image sensors (17) and said processing circuit (20) for generating the digital display (42A and/, or 42B) of the continuation slices ((1), (2), (3), etc.) of said symbol (18) when said reader (10) crosses said symbol (18) and moves in asynchronous (30),
The memory tooth space (42) which memorizes substantially the digital display (42A and/, or 42B) of said continuation slices ((1), (2), (3), etc.) in the real time is provided,
When said programmed control means (30) reaches number with the sufficient number of said displays (1 - N) to decide the data encoded in said symbol (18) about said memory tooth space (42) (208,214 or 308), The handheld computer bar code reader characterized by including the memorized program which stops storage of said digital display (42A and/, or 42B) (214 or 320).
[Claim 17]
Said programmed control means (30) is a bar code reader possessing the central processing unit (40) which controls generating of said digital display according to claim 16 according to the DMA circuit device (35) which controls the storage to said memory tooth space (42) of said memorized program and said display.
[Claim 18]
Said programmed control means (30) is a bar code reader according to claim 16 which generates a timer count display (42B) and fatbits (42A) of said continuation slices ((1), (2), (3), etc.), and makes said fatbits (42A) from said timer count

display (42B) (302) and which is programmed like.
[Claim 19]
It is the memorized program which inspects said digital display in the real time substantially [in order to determine whether the picturized symbol (18) can decode said memorized program as a 1D symbol (72 or 78)]. If a symbol can be decoded as a 1D symbol (112), the symbol will be decoded, without investigating a finder pattern (200). If decode is impossible as a 1D symbol (112), in order to discriminate the finder pattern currently used there from two or more finder patterns (central mold and waist band mold etc.) The bar code reader according to claim 16 which is the memorized program which decodes a symbol about a finder pattern (318) when said digital display is inspected (304) and the mold of this finder is identified.
[Claim 20]
If the picturized symbol is a 1D symbol, said memorized program this 1D symbol (72 or 78) -- a stack 1D symbol (78) -- or it determining, and whether it is linear 1D symbol (72), if it is a stack 1D symbol (78) The bar code reader according to claim 19 which decodes each train of this 1D stack symbol (78) until the data which constitute a perfect message are fully obtained and which is constructed like (206-214).
[Claim 21]
The bar code reader according to claim 19 characterized by providing the following Said memorized programs are component programs for two or more finder discernment (AZTEC, Code One, etc.) which are adapted for each type (central mold and waist band mold etc.) of finder pattern recognition. The program which determines most the component programs (AZTEC, Code One, etc.) corresponding to the finder pattern which applies this component program to the sequential aforementioned digital display, and is used for said symbol (304-320)
[Claim 22]
Said component program for finder discernment is a bar code reader including the 1st component program (AZTEC) which identifies a central mold finder pattern, the 2nd component program (Code One) which identifies a waist band mold finder pattern, and the 3rd component program (Data Matrix) which identifies a peripheral mold finder pattern according to claim 19.
[Claim 23]
One of said the component programs for finder discernment
A number of sets which show whenever [isolation / of the digital component] are drawn from continuation digital display,
A bar code reader including the program which continues and compares the set of said number in order that any of said display may determine whether to have the digital component which has whenever [highest isolation] according to claim 21.
[Claim 24]
Said continuation digital display is a bar code reader according to claim 19 which is inspected and compared in order to identify the symbol structure (85) which memorizes with FIFO and the subset of a continuation digital (bit) display cannot display by single digital (bit) display by this (304,306) and which was made like.
[Claim 25]
Said program is a bar code reader according to claim 21 which stops storage of digital display after a sufficient number (N) of displays which are sufficient for decoding said symbol are generated and which was made like (316).

[Translation done.]

This Page is Inserted by IFW Indexing and Scanning Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☑ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.
As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.